Forms of energy and how they are used

Strand
Energy and Change

Key concepts
In interactions and changes, energy is transferred and transformed but is not created or destroyed.

There are different ways of obtaining and utilising energy and these have different consequences.

Purpose

Activities in this module are designed to help students understand that energy exists in different forms and that their community uses energy in different ways. Students have opportunities to:

- identify and observe evidence of different forms of energy;
- clarify their ideas and concepts about different energy forms and their uses;
- apply ideas and concepts related to the transformation and transfer of energy;
- illustrate understandings through presentation of models.

Overview of activities

The following table shows the activities in this module and the way in which these are organised in **introductory**, **developmental** and **culminating** phases.

Introductory ►	Developmental ►	Culminating
Classroom audit	Ways that toys move	What's cooking?
The world around us	Sounds!	Daily energy
	Lights!	
	Solar power	
	More energy in action	

QUEENSLAND SCHOOL CURRICULUM COUNCIL

Core learning outcomes

This module focuses on the following core learning outcomes from the Years 1 to 10 Science Syllabus:

Energy and Change

1.2 Students identify the effects of energy in their daily lives.

1.3 Students make links between the way they use energy and the immediate source of that energy.

2.2 Students identify and describe forms of energy in their community (including heat and energy of movement).

2.3 Students illustrate the ways that energy is used in their community.

3.2 Students identify forms of energy (including electrical and sound energy) and describe the effects and characteristics of those different forms.

3.3 Students identify different ways of obtaining energy.

Core content

This module incorporates the following core content from the syllabus:

Energy and Change

Transfer and transformation of energy types

- heat, sound, light, electrical

Energy transfers that occur in

- home, community, transport

Sources of energy

- sun

Alternative ways of obtaining energy

- solar hot water

Assessment strategy

Suggestions for gathering information about student learning are provided in each of the activities in this module. Once sufficient information has been collected, judgments can be made about students' demonstrations of outcomes. Typical demonstrations of this module's intended outcomes are provided here to indicate the pattern of behaviour to look for when making judgments.

Energy and Change

1.2 Students identify the effects of energy in their daily lives.

Students may:

- describe how rubbing their hands together warms them;
- show that streamers move when near a fan;
- explain that people feel hot when they are active;
- pluck guitar strings to make musical sounds;
- cook on a solar cooker.

Energy and Change

1.3 Students make links between the way they use energy and the immediate source of that energy.

Students may:

- relate that lights/appliances work when a switch is turned on;
- describe how heat is needed to cook food;
- describe how energy is needed to do physical activities;
- explain that electricity is needed to make electrical appliances work;
- recognise that energy is provided by the battery in torches.

Energy and Change

2.2 Students identify and describe forms of energy in their community (including heat and energy of movement).

Students may:

- identify different forms of energy in their classroom, home and community;
- generalise that there are several forms of energy and be able to relate the various forms to some action or change;
- produce and describe different forms of energy — for example, clapping produces sound energy;
- identify appliances in the classroom that use electrical energy;
- construct their own energy storage devices;
- recognise when energy is transferred or changed;
- describe changes that occur in forms of energy in various situations;
- distinguish between situations where energy is changed (transformed) and passed on (transferred).

Energy and Change

2.3 Students illustrate the ways that energy is used in their community.

Students may:

- identify how electricity is used in the classroom, their homes and the wider community;
- relate how electricity produces other types of energy (through transformations) in the community — for example, electricity is used for lighting streets;
- discuss different ways that solar energy is used — for example, drying clothes, heating water, cooking;
- identify different forms of energy that can be transformed to movement energy and where energy of movement is used.

Energy and Change

3.2 Students identify forms of energy (including electrical and sound energy) and describe the effects and characteristics of those different forms.

Students may:

- relate the effects of different forms of energy — for example, how movement energy pushes a boat through water;
- describe how vibration of parts of a musical instrument makes sound energy;
- recognise that different forms of energy are used in different ways.

Energy and Change

3.3 Students identify different ways of obtaining energy.

Students may:

- relate ways of obtaining energy from nature (sun, wind, water);
- identify batteries and electricity as ways of obtaining energy;
- discuss how energy is stored in batteries, bodies and wind-up toys.

Background information

Current scientific conceptions

In this module the term 'energy' refers to the ability to do work. Energy causes things to move, change shape or grow — that is, **energy is needed to make things happen**. There are different forms of energy including: heat energy, light energy, sound energy, electrical energy, chemical energy, mechanical energy (energy of moving parts), kinetic energy (energy of motion or movement), potential energy (stored energy or energy available to make something happen).

Kinetic energy is the scientific term for energy of movement. This term does not have to be introduced at this stage. Potential energy has not been described in this module. However, some students may raise ideas about storing energy during discussions.

Objects with kinetic energy can give other objects a push or pull. This is called **energy transfer**. For example, the kinetic energy of the wind or moving water can push boats through the water.

Some types of energy can be changed to another form of energy. This changing from one type of energy to another is called **energy transformation**. For example, the chemical energy in food can be changed to heat energy or movement energy in muscles.

Students' prior understandings

Students' prior understandings may differ from current scientific conceptions in a range of ways.

Some students may:

- have heard about energy in relation to their own bodies as something their body has and uses, for example 'I've got no energy/I'm full of energy', or relating to foods advertised as *providing them with energy*, for example 'Ironman food'.
- not be aware that energy can be stored (potential) and transferred or transformed.

Teachers can enhance students' understanding by emphasising correct usage of terminology and by providing opportunities for students to discover different forms of energy and their sources.

Terminology

Terms associated with energy are essential to the activities in this module — for example:

energy forms	energy transfers
energy sources	energy transformations/changes

Students may already be familiar with some of these terms and understand their meanings and use in scientific contexts. If so, the activities will provide opportunities for them to evaluate current usage. If not, these activities will provide opportunities for students to develop their understandings.

School authority policies

Teachers need to be aware of and observe school authority policies that may be relevant to this module.

Safety policies are of particular relevance to the activities that follow. It is essential that demonstrations and student activities be conducted according to procedures developed through appropriate risk assessments at the school.

In this module, teachers need to consider safety issues relating to:

- swinging or flying objects;
- looking at the sun;
- using electricity;
- using heat sources (stove, matches, candles).

Support materials and references

Feely, J. & Scott, J., Collins Dove Pty Ltd, North Blackburn, Vic.
1992, *Floating and Boating*
1993, *Science Starters: Environment*

Fresno Unified Science Specialists 1994, *Primarily Physics: Investigations in Sound, Light and Heat Energy: AIMS Activities Grades K–3*, rev. edn, AIMS Education Foundation, Fresno, California.

Pearce, M. (ed.) 1992, *Big Science: Energy and Its Sources*, Scholastic, New York.

Queensland Department of Education 1982, *Primary Science Sourcebook: Activities for Teaching Science in Year 4*, Brisbane.

Skamp, K. (ed.) 1998, *Teaching Primary Science Constructively*, Harcourt Brace, Marrickville, NSW.

ACTIVITY

Classroom audit

Introductory

Focus

This activity provides opportunities for students to reflect on their concepts of energy, by identifying different forms of energy in their classroom.

Materials

- a selection of electrical appliances that could include:
  - overhead projector
  - CD player
  - TV
  - listening post
  - digital clock
  - computer
  - electric lights
  - fans
  - solar calculator
  - battery-operated clock
  - stove

For each group of students:

- card to label an appliance
- Resource Sheet 1, 'Energy in the classroom'

Teaching considerations

'Starting' and 'finishing' energy are not technical terms. They are used in this activity to facilitate communication and discussion.

Practical point

All classroom appliances in working condition should be functioning during this activity.

Working scientifically

Time: 20 minutes

Identifying
Making observations
Applying ideas and concepts
Making links
Clarifying ideas

▶ As a class, students list the types of energy with which they are familiar. The list is displayed in a prominent place for students' reference.

▶ Each group of two or three students is given a card with the name of one of the appliances on it. The group places the card beside the appropriate appliance. Through subsequent class discussion, students clarify their ideas about the name of each appliance and its function.

Resource Sheet 1

▶ In their groups, students move about the room observing the appliances working. Students identify the energy forms produced. These are recorded on Resource Sheet 1 as the 'finishing energy'. Students then identify the forms of energy being used by the appliance. These are recorded as the 'starting energy'.

► As a class, students discuss the responses on their resource sheet and clarify their ideas about forms of energy. They compile a list of the forms of energy they identified. This is displayed for future reference.

Gathering information about student learning

Sources of information could include:

- students' observations of the appliances;
- students' contributions to discussions;
- students' responses on Resource Sheet 1.

ACTIVITY

The world around us

Introductory

Focus

This activity provides opportunities for students to identify the different forms of energy around them and within their communities.

Materials

- Resource Sheet 2, 'Energy in the community'

Teaching considerations

Preparation

Enlarge Resource Sheet 2 to A3 size if possible. Each group should have one poster-sized sheet.

If the previous activity, 'Classroom audit', was undertaken, the list of forms of energy compiled in that activity could be used as a starting-point for this activity.

Concept

In the preliminary discussion, the idea of chemical energy being stored in food, batteries or petrol could be introduced.

Working scientifically

Time: 30 minutes

Making observations
Inferring from data
Clarifying ideas
Discussing thinking

▶ Students brainstorm a list of forms of energy and suggest observations that provide evidence of this form of energy being used or produced.

▶ Students identify the different forms of energy in the picture from Resource Sheet 2 and highlight them by circling the same kinds of energy in the same colour — for example, movement could be highlighted with blue, sound with green.

Stimulus questions for students could include:

- Which objects produce more than one form of energy?
- Are the people in the picture using energy?
- Where does the energy people are using come from?
- Which forms of energy are more common than others?
- How are different forms of energy important to our community? Why?

These questions could also be used to guide class discussion of this activity.

▶ Students record their ideas about the:

- importance of energy in the community;
- forms of energy most frequently used in the community;
- forms of energy produced in the community.

Gathering information about student learning

Sources of information could include:

- students' engagement with and completion of Resource Sheet 2;
- students' contributions to discussions.

ACTIVITY

Ways that toys move

Developmental

Focus

This activity provides opportunities for students to identify and investigate the movement of different toys.

Materials

- toys which operate without batteries such as:
  - cork boat
  - toy car
  - toy train
  - bicycle
  - balloon
  - kite
  - swing
  - T-ball
  - hula hoop
  - ball
  - trampoline
  - gym ribbon
  - pin wheel or spinning top
  - marble maze
  - paper plane
- butcher's paper and pens

Teaching considerations

The problem students are asked to consider is how to make a toy have energy of movement. Using the terminology from the introductory activities, movement is the 'finishing energy'. Students have to suggest different 'starting energies'. 'Starting' and 'finishing' energy are not scientific terms to describe energy. They are used in this activity to facilitate communication and discussion. In the final discussion students should be encouraged to recognise that the 'starting energy' is changed (transformed) into the 'finishing energy'.

Working scientifically

Time: 30 minutes

Designing and performing investigations
Playing
Predicting
Making links
Creating presentations
Discussing thinking

▶ Students work in small groups. Each group selects a toy and brainstorms a variety of ways to make the toy move.

▶ In preliminary trials students make their toy move by the methods suggested and develop criteria to use when deciding which method was most effective.

▶ Students carry out trials of the different methods, evaluate the methods and present the results of their investigation to the class. The results could be illustrated on butcher's paper.

► Students discuss the findings of the different groups. They relate the ways found of causing movement to examples in everyday life. Discussion questions could include:

- How can you decide which method of making the toy move was the most effective?
- Which ways of making the toy move were found to be most effective?
- Where in your daily life are there objects that are made to move in the same way?
- Movement energy was the 'finishing energy' in each of these instances. What was the 'starting energy'?

Gathering information about student learning

Sources of information could include:

- students' engagement with and contribution to development of criteria;
- students' contributions to planning and performing the investigation;
- students' presentations;
- students' contributions to discussions.

ACTIVITY

Sounds!

Developmental

Focus

This activity provides opportunities for students to investigate sound energy, recognising that different sounds have different characteristics.

Materials

- recordings of different easily recognisable sounds within the community, such as:
  - dogs barking (fierce barking and a friendly bark)
  - a popular jingle or recognisable introduction to a popular show
  - cyclone warning
  - a car braking
  - washing machine washing clothes
  - siren (ambulance, fire engine or police car)
  - train
  - an audience clapping
  - door bell
  - children playing
  - someone yelling (angry voice)
  - school's fire alarm/bomb alert

Teaching considerations

Record sounds that would be familiar to and have meaning for the students.

This activity could be seen as an opportunity to familiarise students with the alarm systems in the school.

Some students with hearing impairment may need assistance for this activity. Seek advice from their support teacher.

Working scientifically

Time: 30 minutes

Making observations
Looking for alternatives
Suggesting
Describing
Listening

▶ Students brainstorm a list of sounds that are common in their environment. Questions to guide their thinking could include:

- What made the sound?
- Sound is the 'finishing energy'. What was the 'starting energy'?
- What was used to change the 'starting energy' into sound?
- What are some of the characteristics of a particular sound — for example, soft/loud, short/long, repeated notes, different notes, high/low pitch?

▶ Students listen to the recordings of the different sounds. They identify each sound and its commonly understood meaning.

▶ Small groups of students are then provided with a list of the sounds that were played. They are asked to group/classify the sounds.

► Students discuss their groupings with the rest of the class. Discussion questions could include:

- What criteria did you use to group the sounds (loudness, tone, pitch, musical/not musical, warning, continuous/intermittent)?
- Do the warning sounds have anything in common?
- How could an angry voice or fierce barking be distinguished from a friendly voice or bark?

► For some of the sounds, students are asked to suggest how the sound energy was produced.

Gathering information about student learning

Sources of information could include:

- students' contributions to discussions;
- students' groupings of the sounds;
- students' explanations of how sound energy was produced.

ACTIVITY

Lights!

Developmental

Focus

This activity provides opportunities for students to investigate light sources.

Materials

- Resource Sheets 3 and 4, 'Sources of light'
- real objects or pictures of objects that produce light energy, such as:
  - hot plate
  - matches
  - candle
  - torch
  - desk lamp (light bulb)
  - lantern
  - fluorescent light
  - glow tube

Teaching considerations

Some students with vision impairment may need assistance for this activity. Seek advice from their support teacher.

Safety

Inform students of safe practices for using objects that produce light and heat.

Working scientifically

Time: 30 minutes

Identifying
Making observations
Applying ideas and concepts
Generalising
Discussing thinking

▶ Students suggest ways in which the Earth's main light source (the sun) influences everyday lives and discuss reasons why the sun is so important to life on Earth. Students brainstorm other sources of light that are important in their community.

▶ As a group, students observe the objects (or pictures of objects) that produce light. They reflect on the characteristics of light sources. Individually, students use their ideas to group objects as light sources or non-light sources.

▶ Students discuss the groups they have created. As a class, students agree on the objects grouped as ones that produce light. Students discuss the changes in form of energy (transformations) that have taken place to produce the light energy. The difference between producing light and reflecting light should feature in the discussion.

Resource Sheets 3, 4

▶ Students complete Resource Sheet 4 by pasting the pictures from Resource Sheet 3 onto it. They add pictures (in spaces provided on the resource sheet) of more light-producing objects and objects which do not produce light.

Gathering information about student learning

Sources of information could include:

- students' completion of the classification activity on Resource Sheet 4;
- students' contributions to discussions.

ACTIVITY

Solar power

Developmental

Focus

This activity provides opportunities for students to investigate solar energy and how it is used.

Materials

- materials to demonstrate the chosen scenarios (e.g. temporary clothes line, absorbent cloth, sunlight-deprived plant in pot)
- solar camp shower (optional)

For each group of students:

- Resource Sheet 5, 'How to make a solar water heater'
- materials listed on Resource Sheet 5 (or other materials to make solar water heaters)

Teaching considerations

Most parts of this activity require a clear, sunny day.

Prepare some different scenarios of situations where energy from the sun is used in everyday situations — for example:

- Spill a small amount of water and wipe it up with an absorbent cloth — ask how the absorbent cloth could be dried.
- Take a prepared plant out of the cupboard — it looks yellow and weak as though it is dying — ask how it might be revived. (To prepare this plant place a healthy green plant in a dark place for a few days until the leaves start to turn yellow.)

Lids from boxes of photocopy paper could be used as the shallow boxes for the solar water heater. These should be collected well in advance. Clear plastic wrap could be used as a lid for the box.

Camp showers are available at camping, hardware and disposal stores.

Working scientifically

Time: 60 minutes

Applying ideas and concepts
Looking for alternatives
Measuring
Constructing models
Explaining ideas

▶ Students are presented with scenarios, like the examples in 'Teaching considerations'. They suggest possible actions. They predict the results of these actions, then carry them out. Students discuss solar energy and ways in which it is used in the community. Discussion questions could include:

- What determines the length of time it takes a wet cloth to dry?
- How would our lives be changed if we lived in a climate which received less heat from the sun?
- What changes do you think will happen to the plant when it is put back into the sun?
- What use do plants make of the sun?
- Apart from drying things, how is energy from the sun used in our community?

▶ If students do not suggest solar hot water systems or solar panels for generating electricity for telephones and repeater stations for mobile phones (these can be seen along highways and other country locations), these and solar calculators should be introduced into the discussion.

Resource Sheet 5

▶ Students discuss the construction of a solar hot water system. Resource Sheet 5 is read and discussed. Students hypothesise where and when they will place their system to obtain the hottest water. In their notebooks they could write and complete this statement:

I will get the hottest water if I put the solar hot water system *position in the school* **at** *time of day*.

▶ Students use their own ideas or follow the instructions on Resource Sheet 5 to construct a model solar hot water system. They decide how they are going to measure the temperature of the water and for how long.

▶ Students record the information collected, discuss their findings, and create a presentation for the class.

Stimuli for discussion could include:

- How did the placement of the system influence the temperature?
- What could you do to improve the heating of the water?
- How could you keep the water warm when the sun is no longer shining?
- Suggest reasons why every house does not have a solar hot water system.

▶ The system with the hottest water is also identified. Reasons for it having the hottest water are discussed.

Additional learning

▶ If available, show students a camp shower built on this principle and discuss its advantages/disadvantages.

Gathering information about student learning

Sources of information could include:

- students' contributions to discussions;
- students' construction of a solar hot water system;
- students' presentations of their findings.

ACTIVITY

More energy in action

Developmental

Focus

This activity provides opportunities for students to further develop their understandings of different forms of energy.

At the same time students are exposed to the concepts of energy transformations and energy transfers.

Materials

- Resource Sheet 6, 'Activity cards: More energy in action'
- running water (tap/hose)
- toy boat (not battery powered) in water trough
- radio
- Plasticine
- hair dryer
- battery powered toy
- bicycle

Teaching considerations

Set up learning centres so that students can move around to complete the activities. Students work cooperatively in groups of three. Activity cards from Resource Sheet 6 should accompany each learning centre.

If the sun is not shining, an alternative heat source is required for the Plasticine activity.

Safety

Inform students about safe practices for:

- using electrical appliances;
- observing objects with moving parts;
- moving around in wet areas.

Working scientifically

Time: 45 minutes

Making observations
Inferring from data
Clarifying ideas and concepts
Discussing thinking

▶ Student groups visit each learning centre and read the instructions on the activity cards. They complete the first three columns of a table like the one shown below.

Investigating energy

Activity	Starting energy	Finishing energy	Passed on/Changed

▶ The class compares their responses in the completed tables, discussing the various types of energy produced (finishing energy) and the action or energy that started the activity.

▶ Introduce the idea of energy being passed on (for example, moving water/moving boat) or changed (for example, electrical energy/sound energy). In the fourth column ask students to indicate what happened in each activity recorded in the table.

Gathering information about student learning

Sources of information could include:

- students' completion of the table of results;
- students' contributions to discussions.

ACTIVITY

What's cooking?

Culminating

Focus

This activity provides opportunities for students to design and create solar cookers to cook a variety of foods.

Materials

- Resource Sheet 7, 'Making a solar cooker'
- materials listed on Resource Sheet 7 or other materials to make solar cookers similar to the demonstration model

Teaching considerations

Ask students to collect boxes and materials suitable for use as insulation in the solar cookers.

Cut a template for the reflectors on the solar cooker to assist students make their own cooker.

A clear, sunny day is needed.

Classroom organisation

Resource Sheet 7

Demonstrate building a solar cooker.

During class discussions about the solar cookers, encourage students to use terms like 'changing energy from the sun into heat energy', 'absorbing heat' and 'reflecting'.

Safety

Students should not look directly at the sun or at the sun's reflection on the alfoil.

Inform students of safe practices for heating materials.

Inform students of safe practices for using knives — for example:

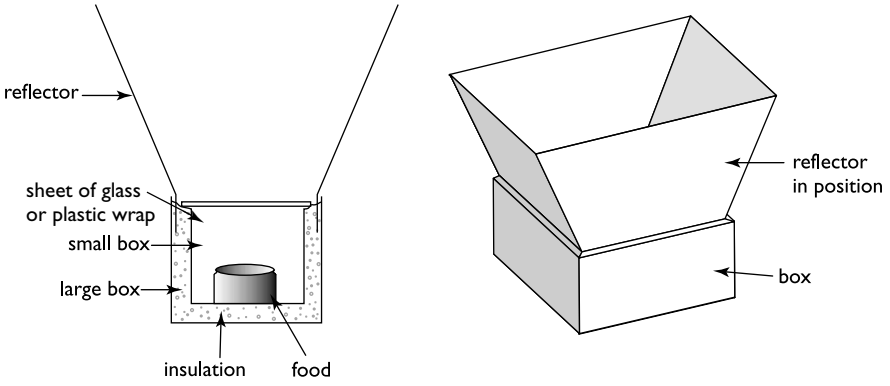
- Cut on mats or thick wads of newspaper.
- Carry knives in sheaths or retract the blades.

Working scientifically

Time: 45 minutes (not including cooking time)

Handling materials
Making plans
Applying ideas and concepts
Making links
Constructing and using models
Describing
Explaining ideas and decisions

▶ Students observe the teacher making a cooker similar to the one below.



▶ While building the cooker, encourage students to think of reasons for the design. Questions to guide their thinking could include:

- Why is the inside of the container black?
- What difference does the layer of insulation make to the cooking process?
- What is the role of the glass or plastic wrap?
- What is the role of the alfoil reflectors?
- Which way should the alfoil reflectors face? How would their size or shape change the cooking time?
- What foods could be cooked using solar energy?

▶ Students discuss ways in which the cookers could be varied and suggest differences the changes could make to the cooking time. They discuss how the class could test these ideas making it a fair test.

▶ In small groups, students collect the materials they need and construct a solar cooker to cook a specified food. They record the ways they varied their cookers from the model, including a labelled diagram.

▶ Students test their cookers recording, on a class chart, how long it took for their food.

▶ Students present their designs and cooker to the class, describe the changes they made, their predictions of the effect of the changes on cooking time and their results.

▶ As a class, students discuss all the results. Discussion questions could include:

- How did the groups' predictions compare with the results?
- What changes influenced the time it took for food to cook?
- Which design appeared to be most effective? Why?
- What effect did each of the suggested changes have on the cooking time?
- How would increasing or decreasing the size of the cooker affect cooking time? Why do you think that?

▶ Students discuss the effectiveness of using energy from the sun to cook.

Gathering information about student learning

Sources of information could include:

- students' contributions to discussions;
- students' completed cookers;
- students' presentations.

ACTIVITY

Daily energy

Culminating

Focus

This activity provides opportunities for students to investigate their own daily use of energy and to identify energy sources.

Materials

For each group of students:

- Resource Sheet 8, 'Daily energy'

Working scientifically

Time: 30 minutes

Analysing
Applying ideas and concepts
Clarifying ideas and concepts
Relating

▶ Students brainstorm a list of the forms of energy with which they are familiar.

▶ Individually, they decide which form of energy they wish to study. They find another person in the class who has selected the same form of energy and work with them.

▶ Using Resource Sheet 8, students list all the occasions they engage with their selected energy form in one day. They identify the energy source.

▶ Students then form a larger group with all the students in the class who were studying the same form of energy. They compare their lists and make additions to complete a master list of all the situations where that energy form was used. These groups then share their master lists with the whole class.

▶ In a class group energy use is discussed. Discussion questions could include:

- Could any other form of energy have been used in any of the situations?
- Did one part of your day involve greater use of the energy form than any other part of your day? Suggest a reason for this.
- Was any form of energy used in more situations than any other form?

Gathering information about student learning

Sources of information could include:

- students' contributions to discussions;
- students' involvement in the activities;
- students' individual, pair, group and whole-class lists.

Energy in the classroom

Appliances	Finishing energy	Starting energy

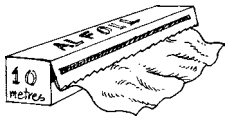
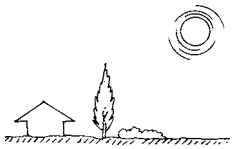
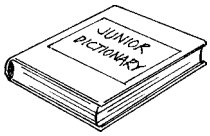
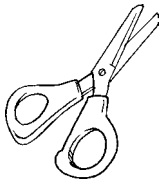
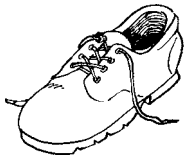
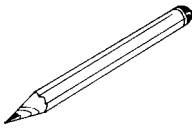
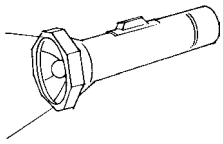
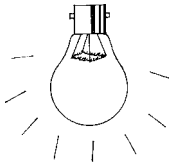
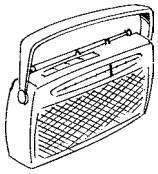
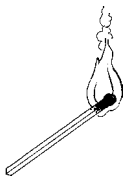
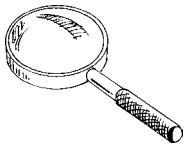
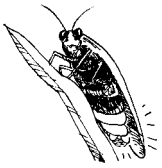
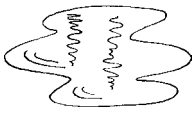
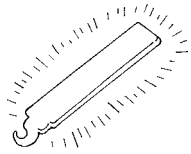
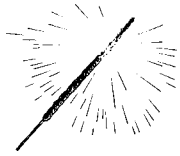
Energy in the community

R2

Resource Sheet 2

Sources of light

Cut out the pictures and decide which ones produce light and which ones do not. Glue them onto Resource Sheet 4 under the appropriate headings.

 aluminium foil	 candle flame	 sun	 plant
 book	 scissors	 shoe	 fire
 lantern flame	 pencil	 torch	 glasses
 light bulb	 lightning	 radio	 match flame
 magnifying glass	 glow worm	 hot plate	 water
 glow tube	 party sparkler		

Sources of light

Resource Sheet 4

Things that produce light		Things that do not produce light	

How to make a solar water heater

R5

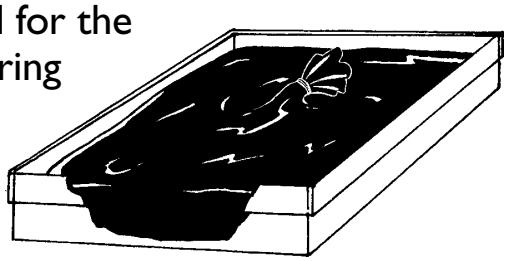
Resource Sheet 5

You will need:

- thermometer
- 5 L water
- small black garbage bag
- shallow box with a clear plastic lid (25 x 35 cm approximately)
- a sunny place

1. Measure the temperature of your water before you start.
2. Partially fill the black garbage bag with 5 L of water and tie it closed (if you use too much water, it will be too difficult to tie). The bag must be tied very tightly so that water does not leak out.

3. Place the plastic bag of water into the shallow box.
4. Use the clear plastic to make a lid for the box. Place this over the box, covering the black plastic bag. Use sticky tape to hold it securely in position. You now have a solar water heater.



5. Leave your solar water heater in direct sunlight for about one hour (or longer if slightly overcast).
6. Assess the effectiveness of your solar water heater by measuring the temperature of the water in the garbage bag after exposure to the sun.

Activity cards: More energy in action

Resource Sheet 6

Activity 1: Boat

1. Turn the tap on gently so that water is flowing down the trough.
2. Place the boat in the water flow.
3. What did you see or hear or feel?
4. Record the form of energy that was produced by the boat (finishing energy).
5. What energy was needed to produce the finishing energy?
6. Record the starting energy.

Activity 2: Radio

1. Turn the radio on.
2. What did you hear or see or feel?
3. Record the form of energy that was produced by the radio (finishing energy).
4. What energy was needed to produce the finishing energy?
5. Record the starting energy.

Activity 3: Plasticine

1. Feel the Plasticine on your hand.
2. Place it out in the sun for at least five minutes.
3. What difference did that make?
4. Record the form of energy that was produced in the plasticine (finishing energy).
5. What energy was needed to produce the finishing energy?
6. Record the starting energy.

(continued)

Activity cards: More energy in action *(continued)*

Activity 4: Hair dryer

1. Turn the hair dryer on.
2. What did you see or hear or feel?
3. Record the form of energy that was produced by the hair dryer (finishing energy).
4. What energy was needed to produce the finishing energy?
5. Record the starting energy.

Activity 5: Toy

1. Turn the toy on.
2. What did you see or hear or feel?
3. Record the form of energy that was produced by the toy (finishing energy).
4. What energy was needed to produce the finishing energy?
5. Record the starting energy.

Activity 6: Bicycle

1. Turn the pedals of the bicycle slowly.
2. What did you see or hear or feel?
3. Record the form of energy that was produced by the bicycle (finishing energy).
4. What energy was needed to produce the finishing energy?
5. Record the starting energy.

Making a solar cooker

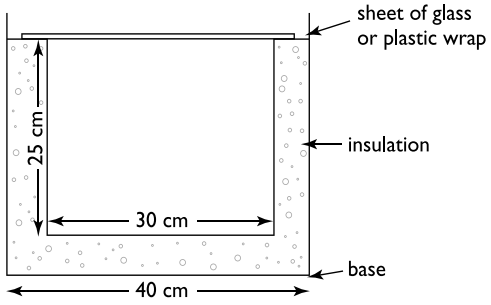
Resource Sheet 7

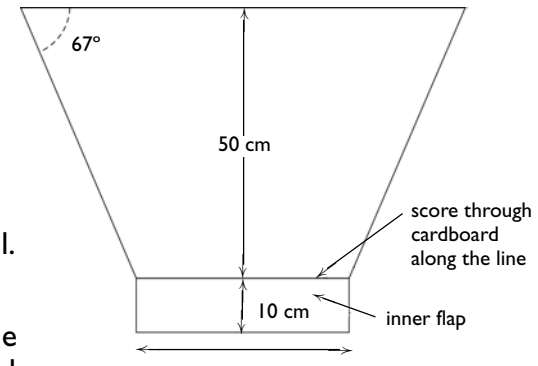
You will need (for each solar cooker):

- one cardboard box (approximately 30 cm square). Square boxes work best but rectangular boxes can be used. The box in which photocopy paper is packed would be suitable.
- a second box, about 5 cm larger in all directions than the first box
- black paint or paper (sufficient to line the first box)
- insulation to fill the space between the two boxes — e.g. newspaper, polystyrene packaging, sheets of corrugated cardboard cut into strips
- a sheet of glass, rigid plastic or a double layer of plastic wrap to fit over the smaller box
- 4 sheets of rigid cardboard approximately 60 x 100 cm. These will be used to make the reflectors. Large cardboard boxes could be cut to provide these.
- aluminium foil (to cover the reflectors)
- strong adhesive tape (to hold the reflectors together)

To make the cooker (refer to the diagrams)

1. Paint the inside of the smaller box with black paint or line the box with black paper.
2. Place insulating materials on the floor of the larger box to a depth of 5 cm.
3. Place the smaller box inside the larger box and pack insulating materials down the sides to fill the space between the two boxes.
4. Using the information in the diagram cut four pieces of cardboard to make the reflectors. Score the cardboard along the line between the main part of the reflector and the flap. Bend the reflector at this point.
5. Cover one side of the reflectors with alfoil.
6. Tape the reflectors together so that the inner flaps form a square that fits inside the rim of the large box. Make sure that the side of the reflector covered with the alfoil is facing in toward the box.



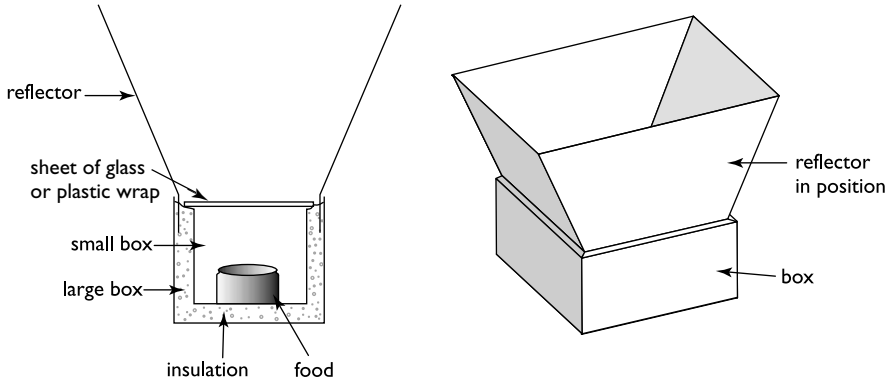


width is equal to the length of the side of the outer box — two different widths if the box is rectangular

(continued)

Making a solar cooker *(continued)*

7. Place the reflectors on top of the box.



8. Place the food to be cooked on a tray in the smaller box.

9. Cover the smaller box with the glass or plastic.

10. Leave the solar cooker in a sunny position and angle the cooker so that the reflectors are facing the sun.

What to cook

Rice or lentils could be cooked in a jar containing some water. Cut a hole in the lid of the jar to avoid a build-up of pressure as the contents heat up.

Potatoes and sweet potato, lightly oiled, cook well on a rack.

Daily energy

R8

Resource Sheet 8

Energy form selected _____

Location and time	Object or energy source	Purpose for which the energy was used
At home (before school)		
At school		
Travelling		
At home (after school, at night)		

Acknowledgments

This module is based on material developed by Betty Szymanski who attended a module writing workshop organised by the Science Teachers' Association of Queensland and the Queensland School Curriculum Council.

This sourcebook module should be read in conjunction with the following Queensland School Curriculum Council materials:

Years 1 to 10 Science Syllabus
Years 1 to 10 Science Sourcebook: Guidelines
Science Initial In-service Materials

ISBN 0 7345 2023 9

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PIP 99310