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|  | Australian Curriculum Year 8 Science sample assessment ׀ Assessment resource  Energy test |

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# Current scientific conceptions and students’ prior understandings

## Current scientific conceptions

### Energy

Energy is the ability to do work. It can be classified as either kinetic or potential energy. Kinetic energy is the energy an object possesses when it is moving. It is often called movement energy. Potential energy is energy that is stored. It can be stored in a variety of forms. For example, the energy stored in food is chemical potential energy.

Energy comes in many forms — for example, heat, light, sound, solar and electrical energy. These forms of energy may come from a variety of sources. It is important to recognise the difference between an energy source and an energy form — that is, the energy source produces the particular form(s) of energy. For example, food is a source of chemical potential energy.

#### Heat energy

Heat is a form of energy that comes from many sources. The sun, friction, some chemical reactions (including burning) and reactions occurring in the Earth’s core all provide heat energy.

#### Light energy

Some wavelengths of radiant energy from the sun can be detected by our eyes. These wavelengths are called light energy.

#### Sound energy

Sound is a form of energy that travels as vibrations through solids, liquids and gases. The sounds we hear are caused when a moving object makes the air vibrate. These vibrations, travelling through the air, are picked up by our ears and translated by our brains into sounds.

#### Solar energy

The sun produces radiant energy over a range of wavelengths. Some wavelengths are detected by our eyes and are called light energy. When wavelengths in the infra-red range come into contact with matter, they are changed to heat energy.

#### Electrical energy

An electric current consists of a flow of tiny particles called electrons.

Batteries are a useful way of storing energy. They change chemical potential energy into electricity. Each cell of a battery contains two electrodes. A chemical reaction occurring at one electrode makes that electrode positively charged. A different chemical reaction at the other electrode makes that electrode negatively charged. When the electrodes are connected via an external circuit, electrons from the negative electrode flow through the circuit to the positive electrode. This is the electric current.

### Transfer and transformation of energy

Energy can be converted from one form to another, but it cannot be created or destroyed. This can also be stated as energy input is equal to energy output. This is a difficult idea for students who may hold a belief that energy is ‘used up’ during interactions — for example, the energy in fuel and batteries.

Objects with kinetic energy can give other objects a push or pull. This is called energy transfer.

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.

Students need to consider the range of energy conversions and the idea that, in all energy transformations, some energy is converted to heat. In many situations, the heat energy produced is not useful.

The efficiency of energy converters is determined by comparing the energy output (in a useful form) to the energy input and expressing this as a percentage:

efficiency = useful energy output x 100%

energy input

The efficiency of an energy converter is less than 100 per cent since some energy is always converted to heat in a form that is not useful.

## Students’ prior understandings

Forms of energy that should be familiar to students should include heat, light, sound and electrical energy. However, students’ prior understandings may differ from current scientific conceptions in a range of ways.

Some students may:

* not distinguish between forms and sources of energy
* use the terms ‘energy source’ and ‘energy form’ interchangeably
* have heard about energy only in relation to foods such as bread, breakfast cereals and sports drinks
* believe that energy is associated only with living things or moving things
* believe that energy is used up.

Some students may think that energy is a ‘concrete’ substance that can be used up, which differs from the scientific idea that energy is conserved.

## Resources

Sourcebook modules provide teachers with a range of learning and teaching ideas. Teachers are encouraged to modify modules to meet the specific needs and interests of particular groups of students and individual students, their own needs and the learning environment.

* QSA, Science (1999) sourcebook module > Energy and change > Forms and sources of energy [www.qcaa.qld.edu.au/992.html](http://www.qcaa.qld.edu.au/992.html).
* QSA, Science (1999) sourcebook module > Energy and change > Alternatives in energy [www.qcaa.qld.edu.au/992.html](http://www.qcaa.qld.edu.au/992.html).
* QSA, Science (1999) sourcebook module > Energy and change > Obtaining and using energy efficiently [www.qcaa.qld.edu.au/992.html](http://www.qcaa.qld.edu.au/992.html).