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|  | Australian Curriculum Year 8 Science sample assessment ׀ Teacher guidelines  Energy test |

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| Assessment description | Category |
| Under supervised conditions students identify and investigate changes within systems caused by energy, and discuss efficiency and the use of technology in finding solutions to contemporary problems. | Written |
| Technique |
| Supervised assessment |
| Context for assessment | Alignment |
| Energy appears in a number of different forms and is needed to cause change in systems. The sourcing of energy is a contemporary issue in which technology is integral to finding solutions.  Students will:   * identify types of energy and describe transformations * solve problems by calculating gravitational potential energy and kinetic energy and efficiency * analyse data to draw conclusions * evaluate claims. | *Australian Curriculum* [*v7.0*](http://www.australiancurriculum.edu.au/Home/CurriculumHistory), Year 8 Science Australian Curriculum content and achievement standard ACARA — Australian Curriculum, Assessment and Reporting Authority  [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au)  Year 8 Science standard elaborations  [www.qcaa.qld.edu.au/yr8-science-resources.html](http://www.qcaa.qld.edu.au/yr8-science-resources.html) |
| Connections |
| This assessment can be used with the QCAA Australian Curriculum resource titled *Year*8 *Year plan* available at: [www.qcaa.qld.edu.au/yr8-science-resources.html](http://www.qcaa.qld.edu.au/yr8-science-resources.html%20) |
| Definitions |
| * **Kinetic energy** = 1/2 mv2 * **Gravitational potential energy** = mgh * **Percentage efficiency** = (output/input) \* 100 |
| In this assessment | Assessment materials |
| Teacher guidelines | Calculator |
| Task-specific standards — continua | Stimulus (for Part B) |
| Task-specific standards — matrix |  |
| Assessment resource: Sample response |  |
| Assessment resource: Current scientific conceptions and students’ prior understandings |  |
| Assessment resource: Energy test stimulus |  |
| Student booklet |  |

# Teacher guidelines

## Identify curriculum

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| Content descriptions to be taught | | |
| Science Understanding | Science as a Human Endeavour | Science inquiry skills |
| Physical sciences   * Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems [ACSSU155](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSSU155) | Nature and development of science   * Science knowledge can develop through collaboration and connecting ideas across the disciplines of science [ACSHE226](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSHE226)   Use and influence of science   * Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations [ACSHE135](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSHE135) | Processing and analysing data and information   * Construct and use a range of representations, including graphs, keys and models to represent and [analyse](http://www.australiancurriculum.edu.au/Glossary?a=S&t=Analyse) patterns or relationships, including using [digital technologies](http://www.australiancurriculum.edu.au/Glossary?a=S&t=Digital%20technologies) as appropriate [ACSIS144](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSIS144) * Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions [ACSIS145](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSIS145) |
| General capabilities (GCs) and cross‑curriculum priorities (CCPs)  This assessment may provide opportunities to engage with the following GCs and CCPs. Refer also to the Resources tab on the Year 8 Science Australian Curriculum and resources page [www.qcaa.qld.edu.au/yr8-science-resources.html](http://www.qcaa.qld.edu.au/yr8-science-resources.html) | | |
| Description: gc_literacy Literacy  Description: Description: gc_numeracy Numeracy  *Description: Description: gc_critical* Critical and creative thinking | | |
| Achievement standard  This assessment provides opportunities for students to demonstrate the following highlighted aspects. | | |
| By the end of Year 8, students [compare](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Compare) physical and chemical changes and use the particle model to [explain](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Explain) and [predict](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Predict) the properties and behaviours of substances. They [identify](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Identify) different forms of energy and [describe](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Describe) how energy transfers and transformations cause change in simple systems. They [compare](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Compare) processes of rock formation, including the time scales involved. They [analyse](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Analyse) the relationship between structure and function at cell, organ and body system levels. Students [examine](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Examine) the different science knowledge used in occupations. They [explain](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Explain) how evidence has led to an improved understanding of a scientific idea and [describe](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Describe) situations in which scientists collaborated to generate solutions to contemporary problems.  Students [identify](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Identify) and [construct](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Construct) questions and problems that they can [investigate](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Investigate) scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They [identify](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Identify) variables to be changed, measured and controlled. Students [construct](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Construct) representations of their data to reveal and [analyse](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Analyse) patterns and trends, and use these when justifying their conclusions. They [explain](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Explain) how modifications to methods could improve the quality of their data and [apply](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Apply) their own scientific knowledge and investigation findings to [evaluate](http://www.australiancurriculum.edu.au/Glossary?a=F10AS&t=Evaluate) claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types. | | |
| Source: ACARA, The Australian Curriculum v7.0, [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au) | | |

## Sequence learning

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| Suggested learning experiences |
| This assessment leads on from the learning experiences outlined in the QCAA’s Year 8 Science unit overview. The knowledge, understanding and skills developed in the exemplar unit will prepare students to engage in this assessment:   * See Year 8 plan — Australian Curriculum: Science exemplar   [www.qcaa.qld.edu.au/downloads/p\_10/ac\_science\_yr8\_plan.docx](http://www.qcaa.qld.edu.au/downloads/p_10/ac_science_yr8_plan.docx) |
| Adjustments for needs of learners |
| To make adjustments, teachers refer to learning area content aligned to the student’s chronological age, personalise learning by emphasising alternate levels of content, general capabilities or cross-curriculum priorities related to the chronological age learning area content. The emphasis placed on each area is informed by the student’s current level of learning and their strengths, goals and interests. Advice on the process of curriculum adjustment for all students and in particular for those with disability, gifted and talented or for whom English is an additional language or dialect are addressed in *Australian Curriculum — Student Diversity* materials.  For information to support students with diverse learning needs, see:   * Queensland Curriculum and Assessment Authority materials for supporting students with diverse learning needs [www.qcaa.qld.edu.au/10188.html](http://www.qcaa.qld.edu.au/10188.html) * Australian Curriculum Student Diversity  [www.australiancurriculum.edu.au/StudentDiversity/Overview](http://www.australiancurriculum.edu.au/StudentDiversity/Overview) * The *Melbourne Declaration on Educational Goals for Young Australians* [www.curriculum.edu.au/verve/\_resources/National\_Declaration\_on\_the\_Educational\_Goals\_for\_Young\_Australians.pdf](http://www.curriculum.edu.au/verve/_resources/National_Declaration_on_the_Educational_Goals_for_Young_Australians.pdf) * The *Disability Standards for Education* [www.ag.gov.au](http://www.ag.gov.au). |
| Resources |
| Online   * The Learning Federation, *Learning objects in the Energy chains series (Years 4–8) Primary*, [www.ndlrn.edu.au/using\_digital\_resources/australian\_curriculum\_resources/science.html](http://www.ndlrn.edu.au/using_digital_resources/australian_curriculum_resources/science.html) * BBC, *Energy transfer and storage*, [www.bbc.co.uk/schools/ks3bitesize/science/energy\_electric'ity\_forces/energy\_transfer\_storage/ activity.shtml](http://www.bbc.co.uk/schools/ks3bitesize/science/energy_electric'ity_forces/energy_transfer_storage/activity.shtml) * Alternative Fuel Vehicles, *Transportation Energy: A student’s guide to alternative fuel vehicles*, [www.energyquest.ca.gov/transportation/electric.html](http://www.energyquest.ca.gov/transportation/electric.html) * Discovery Education, *Energy and Cars: What does the future hold?* [www.discoveryeducation.com/teachers/free-lesson-plans/energy-and-cars-what-does-the-future-hold.cfm](http://www.discoveryeducation.com/teachers/free-lesson-plans/energy-and-cars-what-does-the-future-hold.cfm) Bureau of Meteorology, *Indigenous weather knowledge* [www.bom.gov.au/iwk](http://www.bom.gov.au/iwk/) * Oresome resources: Minerals and Energy Education*, Coal-fired energy plant interactive*, [www.oresomeresources.com/interactives\_view/resource/interactive\_coal\_fired\_energy\_plant/section//parent//category/](http://www.oresomeresources.com/interactives_view/resource/interactive_coal_fired_energy_plant/section/parent/category/) * Khan Academy — Physics <https://www.khanacademy.org/science/physics>   Objects   * Calculator |

## Develop assessment

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| Preparing for the assessment |
| Learning experiences in preparation for the assessment could include:  Revising key concepts   * Revise from Year 6 that: * electrical circuits provide a means of transferring and transforming electricity * energy from a variety of sources can be used to generate electricity * change in state is caused by heating or cooling.   Exploring energy   * Use the units of energy (joules and kilojoules) to describe the amount of energy in a range of everyday situations. * Identify and describe the common forms of energy in everyday situations, e.g. kinetic, gravitational potential, elastic potential, chemical, nuclear, sound, heat, light and electrical. * Investigate and draw conclusions about energy transfers and transformations in experiments. * Identify energy transfers and transformations in household appliances and draw energy chains to show energy conversions. * Solve word problems to calculate kinetic energy and gravitational potential energy. * Calculate the percentage efficiency of an energy transformation. * Link heat loss to change of state. * Recognise and discuss that heat energy is often produced as a by-product of energy transfers and transformations, such as brakes on a car and light globes. * Draw line graphs to represent two sets of experimental data. * Interpret data in tables and represented in graphs and use to justify conclusions. * Discuss issues associated with the use of petroleum fuels in cars. * Research alternative sources of energy to power future cars, including hybrid vehicles. Discuss the advantages and disadvantages of each alternative. * Recognise the different greenhouse gases and their sources. |

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| Implementing |
| Teacher role  When implementing the assessment, consider:   * whether the test will be implemented in one session, or over multiple sessions using the separate sections of the Student booklet: * Part A: Short-response questions * Part B: Stimulus-response questions * the time required for students to complete each section of the assessment (Part A approximately 60 minutes, Part B approximately 30 minutes) * the distribution of stimulus multiple days before the assessment and clarifying the instructions with students * allowing calculators to be used in the assessment * clarifying what is required in the *Student booklet* and the *Task-specific standards* as needed * instructing students to work individually throughout the assessment * reading questions aloud to the class, if required, to ensure literacy demands do not prevent students from providing evidence of their understanding and skills in science * encourage students to highlight key words to assist with the deconstruction of the questions. |

## Make judgments

When making judgments about the evidence in student responses to this assessment, teachers are advised to use the task-specific standards provided. The development of these task-specific standards has been informed by the Queensland Year 8 standard elaborations. See [www.qcaa.qld.edu.au/yr8-science-resources.html](http://www.qcaa.qld.edu.au/yr8-science-resources.html)

### The Queensland standard elaborations for Science

The Queensland Year 8 standard elaborations for Science are a resource to assist teachers to make consistent and comparable evidence-based A to E (or the Early Years equivalent) judgments. They should be used in conjunction with the Australian Curriculum achievement standard and content descriptions for the relevant year level.

The Queensland Science standard elaborations provide a basis for judging *how well* students have demonstrated what they know, understand and can do using the Australian Curriculum achievement standard.

The Australian Curriculum achievement standards dimensions of Understanding and Skills are used to organise the Queensland Science standard elaborations. Understanding and Skills in Science are organised as Understanding dimension and Skills dimension.

The valued features of Science, drawn from the achievement standard and the content descriptions for Understanding dimension and Skills dimension, are organised as:

* Science understanding
* Science as a human endeavour
* Questioning and predicting
* Planning and conducting
* Processing and analysing data and information
* Evaluating
* Communicating.

#### Task-specific standards

Task-specific standards give teachers:

* a tool for directly matching the evidence of learning in the response to the standards
* a focal point for discussing students’ responses
* a tool to help provide feedback to students.

Task-specific standards are not a checklist; rather they are a guide that:

* highlights the valued features that are being targeted in the assessment and the qualities that will inform the overall judgment
* specifies particular *targeted aspects* of the curriculum content and achievement standard
* aligns the valued feature, task-specific descriptor and assessment
* allows teachers to make consistent and comparable on-balance judgments about student work by matching the qualities of student responses with the descriptors
* clarifies the curriculum expectations for learning at each of the five grades (A–E or the Early Years equivalent)
* shows the connections between what students are expected to know and do, and how their responses will be judged and the qualities that will inform the overall judgment
* supports evidence-based discussions to help students gain a better understanding of how they can critique their own responses and achievements, and identify the qualities needed to improve
* encourages and provides the basis for conversations among teachers, students and parents/carers about the quality of student work and curriculum expectations and related standards.

#### Task-specific valued features

Task-specific valued features are the discrete aspects of the valued features of Science targeted in a particular assessment and incorporated into the task-specific standards for that assessment. They are selected from the Queensland Science standard elaborations valued features drawn from the Australian Curriculum achievement standard and content descriptions.

##### Task-specific valued features for this assessment

The following table identifies the valued features for this assessment and makes explicit the understandings and skills that students will have the opportunity to demonstrate. This ensures that the alignment between what is taught, what is assessed and what is reported is clear.

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| Australian Curriculum achievement standard dimensions | Queensland standard elaborations valued features | Task-specific valued features |
| Understanding dimension | Science Understanding | Analysis of data and information to identify types of energy, describe energy transfers, transformations, efficiency and develop explanations  **Section A: Questions 1, 2, 5, 6, 7** |
| Application of science knowledge to generate solutions about:   * kinetic energy * gravitational potential * energy * percentage efficiency   **Section A: Questions 3, 4, 9, 10** |
| Science as a Human Endeavour | Explanation of how evidence has improved understanding of science ideas and informed the collaboration of scientists to generate solutions to contemporary problems  **Section B: Questions 11, 13** |
| Skills dimension | Processing and analysing data and information | * Use of patterns and trends in graphs to explain relationships and justify conclusions * Construction of graphs to reveal patterns and trends about greenhouse gas emissions in cars vs. trains   **Sections A and B: Questions 8, 12** |

The task-specific standards for this assessment are provided in two models using the same task‑specific valued features:

* matrix
* continua

#### Matrix and continua

Task-specific standards can be prepared as a matrix or continua. Both the continua and the matrix:

* use the Queensland standard elaborations to develop task-specific descriptors to convey expected qualities in student work — A to E (or the Early Years equivalent)
* highlight the same valued features from the Queensland standard elaborations that are being targeted in the assessment and the qualities that will inform the overall judgment
* incorporate the same task-specific valued features, i.e. make explicit the particular understanding/skills that students have the opportunity to demonstrate for each selected valued feature
* provide a tool for directly matching the evidence of learning in the student response to the standards to make an on-balance judgment about achievement
* assist teachers to make consistent and comparable evidence-based A to E (or the Early Years equivalent) judgments.

##### Matrix

The matrix model of task-specific standards uses the structure of the Queensland standard elaborations to organise the task-specific valued features and standards A to E (or the Early Years equivalent). The task-specific descriptors of the standard described in the matrix model use the same degrees of quality described in the Queensland standard elaborations.

Teachers make a judgment about the task-specific descriptor in the A to E (or the Early Years equivalent) cell of the matrix that best matches the evidence in the students’ responses in order to make an on-balance judgment about how well the pattern of evidence meets the standard.

The matrix is a tool for making both overall on-balance judgments and analytic judgments about the assessment. Achievement in each valued feature of the Queensland standard elaboration targeted in the assessment can be recorded and feedback can be provided on the task-specific valued features.

##### Continua

The continua model of task-specific standards uses the dimensions of the Australian Curriculum achievement standard to organise task-specific valued features and standards as a number of reference points represented progressively along an A to E (or Early Years equivalent) continuum. The task-specific valued features at each point are described holistically. The task‑specific descriptors of the standard use the relevant degrees of quality described in the Queensland standard elaborations.

Teachers determine a position along each continuum that best matches the evidence in the students’ responses to make an on-balance judgment about achievement on the task.

The continua model is a tool for making an overall on-balance judgment about the assessment and for providing feedback on task-specific valued features.

## Use feedback

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| Feedback to students | Evaluate the information gathered from the assessment to inform teaching and learning strategies. Focus feedback on the student’s personal progress and the next steps in the learning journey.  Offer feedback that:   * maximises students’ opportunities to succeed in the assessment by providing feedback on: * constructing data representations * developing justified explanations (rather than descriptions) * identifying patterns and relationships in data * interpreting data, information and diagrams to solve problems * involves students in the process by providing opportunities to ask follow-up questions * focuses on each student’s personal progress relative to previous achievements * identifies the characteristics of a high-quality response that aligns with the descriptors in the task-specific standards.   The task-specific standards for this assessment can be used as a basis for providing feedback to students. |
| Resources | For guidance on providing feedback, see the professional development packages titled:   * *About feedback* [www.qcaa.qld.edu.au/downloads/p\_10/as\_feedback\_about.docx](http://www.qcaa.qld.edu.au/downloads/p_10/as_feedback_about.docx) * *Seeking and providing feedback* [www.qcaa.qld.edu.au/downloads/p\_10/as\_feedback\_provide.docx](http://www.qcaa.qld.edu.au/downloads/p_10/as_feedback_provide.docx) |