Cool it!

Assessment description	Category
Students conduct an investigation to determine which insulator will keep ice solid for longer.	Written
	Technique
	Experimental investigation
Context for assessment	**Alignment**
Insulators can be used to prevent heat transfer. In this assessment, students will investigate the best material to prevent the change of state of solid water (ice) to liquid water. The assessment provides opportunities for students to demonstrate science inquiry skills such as: • making predictions • conducting investigations • processing and analysing data and information.	*Australian Curriculum v7.2,* Year 3 Science Australian Curriculum content and achievement standard ACARA — Australian Curriculum, Assessment and Reporting Authority www.australiancurriculum.edu.au Year 3 Science standard elaborations available at: www.qcaa.qld.edu.au/downloads/p_10/ac_sci_yr3_se.docx
	Connections
	This assessment can be used with the QCAA Australian Curriculum resource titled *Year 3 plan — Australian Curriculum: Science* exemplar available at: www.qcaa.qld.edu.au/downloads/p_10/ac_science_yr3_plan.docx
	Definitions
	Insulator: (in the context of this assessment) a material or an object that does not easily allow heat to pass through it.
In this assessment	**Assessment materials**
Teacher guidelines Student booklet Task-specific standards — continua Task-specific standards — matrix Assessment resource 1 — Sample response Assessment resource 2 — Scientific inquiry process	Per group: • three 250mL plastic juice or water bottles • one sheet each of bubble wrap, newspaper and aluminium foil — enough to cover the bottles • sticky tape • three drinking glasses/cups • 250mL measuring cup • medicine glass • stopwatch • water • access to a freezer

Teacher guidelines

Identify curriculum

Content descriptions to be taught		
Science Understanding	**Science as a Human Endeavour**	**Science Inquiry Skills**
Chemical science • A change of state between solid and liquid can be caused by adding or removing heat ACSSU046	**Use and influence of science** • Science knowledge helps people to understand the effect of their actions ACSHE051	**Questioning and predicting** • With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge ACSIS053 **Planning and conducting** • Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate ACSIS055 **Processing and analysing data and information** • Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends ACSIS068 • Compare results with predictions, suggesting possible reasons for findings ACSIS216 **Communicating** • Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports ACSIS071

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 3 Science curriculum and assessment page: www.qcaa.qld.edu.au/yr3-science-resources.html

- Literacy
- ICT capability
- Critical and creative thinking
- Personal and social capability

Achievement standard

This assessment provides opportunities for students to demonstrate the following highlighted aspects.

By the end of Year 3, students use their understanding of the movement of the Earth, materials and the behaviour of heat to suggest explanations for everyday observations They describe features common to living things. They describe how they can use science investigations to respond to questions and identify where people use science knowledge in their lives.

Students use their experiences to pose questions and predict the outcomes of investigations. They make formal measurements and follow procedures to collect and present observations in a way that helps to answer the investigation questions. Students suggest possible reasons for their findings. They describe how safety and fairness were considered in their investigations. They use diagrams and other representations to communicate their ideas.

Source: ACARA, The Australian Curriculum v7.2, www.australiancurriculum.edu.au.

Sequence learning

Suggested learning experiences

This assessment leads on from the learning experiences outlined in the QCAA's Year 3 Science Year level plan. The knowledge, understanding and skills in the Year level plan will prepare students to engage in this assessment:

- See Year 3 plan — Science exemplar www.qcaa.qld.edu.au/downloads/p_10/ac_science_yr3_plan.docx

Adjustments for needs of learners

To make adjustments, teachers refer to learning area content aligned to the child's chronological age, personalise learning by emphasising alternate levels of content, general capabilities or cross-curriculum priorities in relation 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 children with diverse learning needs www.qcaa.qld.edu.au/10188.html
- Australian Curriculum Student Diversity www.australiancurriculum.edu.au/StudentDiversity/Student-diversity-advice
- 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
- The *Disability Standards for Education* www.ag.gov.au.

Resources

Online — websites teachers may find useful

- BBC Schools Science Clips, *Solids and Liquids,* www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids.shtml
- BBC Schools Science Clips, *Changing State,* www.bbc.co.uk/schools/scienceclips/ages/9_10/changing_state.shtml

Develop assessment

Preparing for the assessment

Learning experiences in preparation for the assessment could include:

Revising key concepts

The following are revision opportunities. These may be necessary if the physical sciences content has been taught prior to this unit:

- Revise:
  - how heat is transferred through solids and liquids
  - that heat flows from warmer objects to cooler objects

Exploring changes in state and heat energy

Learning experiences in preparation for the assessment could include the following.

- Explore the characteristics of solids and liquids.
- Investigate how solids and liquids respond to changes in temperature, e.g. liquid water changing to ice and vice versa.
- Explain the relationship between heat and temperature, i.e. if heat is added then this is observed as an increase in temperature; if heat is removed this is observed as a decrease in temperature.
- Discuss that heat is a form of energy.
- Discuss that cold is not energy (a common misconception); it is just the absence of heat.
- Predict the effect of heat on solid and liquid materials.
- Brainstorm everyday examples where materials are used to slow the transference of heat, e.g. using a screen on the windscreen of a car to keep the interior cooler on a hot day.
- Introduce the term 'insulation' and explain that it may be used both to keeps things warm and to keep things cool.
- Investigate the best materials to be used as insulators.
- Identify questions in familiar contexts that can be investigated scientifically and predict what might happen.
- Guide students to suggest ways to plan and conduct safe and fair investigations about the characteristics of liquids and solids and their change in state.
- Support students to carry out simple investigations in small groups.
- Support students to record and represent data using tables, column graphs and labelled scientific diagrams and model the appropriate features of these.
- Discuss any data collected as a class in order to identify and explain patterns in the data, justify findings and compare with predictions.
- Support students to communicate ideas using a simple report format.
- Identify real-life situations where newly acquired science knowledge is currently being applied or may be applied in the future.

Implementing

Section 1. Making predictions

Student role	Teacher role
• Participate in a discussion about the purpose of the assessment. • Clarify your understanding of the investigation question (if necessary). • Write your prediction and explain why you think it will happen.	• Introduce the assessment and relate to students' prior understandings of heat energy and changes in state. • Present the investigation question, clarifying student understanding of this where necessary. • Monitor students as they complete their predictions. Explain the importance of providing an explanation (justification) for their answers.

Section 2. Conducting the investigation	
Student role • Clarify your understanding of how the equipment is to be assembled (if necessary). • Clarify your understanding of the method (if necessary). • Assemble the equipment and conduct the investigation in a small group following the teacher's instructions.	**Teacher role** • Ensure all students understand how the equipment is to be assembled. • Read the Method and explain each step in the process clearly to the students. Clarify student understanding where necessary. • Use your knowledge of the students' personalities and abilities to place students in groups of three. Each student will be responsible for one of the insulated bottles. • Discuss behavioural and safety expectations for the investigation, e.g. working safely, cooperating and sharing, listening to each other. • Provide each group with the necessary materials and equipment. • Support and guide students to assemble the apparatus and conduct the investigation.
Section 3. Recording results	
Student role • Measure the amount of water collected from the three insulated bottles at 30 minute intervals for 90 minutes. Record the data in the table provided in the *Student booklet*. • Use the three measurements to calculate the **total** amount of water collected from each of the three insulated bottles. • Use coloured pencils to create a column graph on the grid provided in the *Student booklet* to show the total volume of water collected from each of the three insulated bottles.	**Teacher role** • Signal to students at the appropriate given intervals (30 minutes) to measure and record their data. • Remind group members they are responsible for taking measurements from one of the three insulated bottles. • Support and guide students as they collect their measurements. Ensure that all students are recording their data in the table provided. • At the end of the investigation, assist students to calculate the total amount of water collected from each of the three insulated bottles. • Provide students with coloured pencils to complete their column graphs. Draw students' attention to the scale of the vertical axis (2 mL) and explain how to colour halfway up one of the rectangles on the grid if a measurement is an odd number.
Section 4. Explaining your results	
Student role • Clarify your understanding of the Discussion questions in the *Student booklet* (if necessary). • Answer the Discussion questions in the *Student booklet* and use the evidence from the results tables and column graph to explain your decisions. • Clarify your understanding of the Conclusion cloze passage in the *Student booklet* (if necessary). • Complete the Conclusion cloze passage in the *Student booklet*.	**Teacher role** • Read the Discussion questions to the students, clarifying understanding of these where necessary. • Monitor students as they complete the Discussion questions. Reiterate the importance of using the evidence collected and recorded in the results tables and column graph to provide an explanation (justification) for their answers. • Read the Conclusion cloze passage to the students. Explain that not all words form the word bank are to be used in the passage. • Monitor students as they complete the Conclusion cloze passage.

Section 5. Applying your science knowledge	
Student role • Clarify your understanding of the information and question in the Applying your science knowledge section of the *Student booklet* (if necessary). • Apply the science knowledge you have learned in the investigation to complete the question in the *Student booklet*.	**Teacher role** • Read the information and question to the students, clarifying understanding of these where necessary. • Monitor students as they complete the question. Reiterate the importance of providing an explanation (justification) for their answers.

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 3 standard elaborations.
See https://www.qcaa.qld.edu.au/downloads/p_10/ac_sci_yr3_se..docx

The Queensland standard elaborations for Science

The Queensland Year 3 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.

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.

Australian Curriculum achievement standard dimensions	Queensland standard elaborations valued features	Task-specific valued features
Understanding dimension	Science Understanding	**Section 4: Explaining your results — Conclusion** Explanation of observations by selecting words from the word bank to complete the cloze passage
	Science as a Human Endeavour	**Section 5: Applying science knowledge** Application of science knowledge about insulation preventing heat transfer in a real-life situation
Skills dimension	Questioning and predicting	**Section 1: Making predictions** Prediction about which insulator will keep ice solid for longer
	Planning and conducting	**Section 3: Recording results** Collection and recording of data in the results tables
	Processing and analysing data and information	**Section 3: Recording results** **Section 4: Explaining your results — Discussion** Presentation of collected data to draw a column graph and use of the data in the results tables and column graph to explain findings
	Communicating	**Sections 1, 3, 4, 5** Communication of ideas and findings in a variety of ways (short responses, tables, column graph, cloze passage)

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

- a matrix
- a 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 student 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 student 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

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. The task-specific standards for this assessment can be used as a basis for providing feedback to students. Offer feedback that: • maximises the students' opportunities to succeed in the assessment by providing feedback on investigations carried out during the term. Specifically about: – making reasoned predictions – accurately collecting and recording data in tables and column graphs – using the data in tables and column graphs as evidence to give reasoned explanations for investigation findings • involves students in the process by providing opportunities to ask follow-up questions • focuses on each student's personal progress relative to their previous achievements • identifies the characteristics of a high quality response that aligns with the descriptors in the *Task-specific standards*.
Resources	Hattie, J and Timperley, H 2007 'The Power of Feedback', *Review of Educational Research*, Vol. 77, No.1, pp. 81–112. 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 • *Seeking and providing feedback* www.qcaa.qld.edu.au/downloads/p_10/as_feedback_provide.docx

Cool it!

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Conduct an investigation to determine which insulator will keep ice solid for longer.

You will:

- make predictions
- conduct an investigation
- record results
- explain your results
- apply your science knowledge to a real-life situation.

Section 1. Making predictions

Question *What you are trying to find out by doing the investigation.*

Which insulator will keep ice solid for longer: bubble wrap, newspaper or aluminium foil?

Prediction *What you think is going to happen in the investigation.*

I think the …… **will be the best insulator and will keep the ice solid for longer.**

I think this because ……

.....

.....

.....

Section 2. Conducting the investigation

Materials and equipment *The things you will need to do the investigation.*

- three empty 250 mL plastic juice or water bottles
- one sheet each of bubble wrap, newspaper and aluminium foil — enough to cover the bottles
- sticky tape
- three drinking glasses/cups
- a 250 mL measuring cup
- a medicine glass
- water
- a stopwatch
- a freezer.

Method *The steps you will follow during the investigation.*

Step 1

- Use the measuring cup to measure exactly 150 mL of water.
- Pour into one of the empty plastic juice or water bottles and replace the lid.
- Repeat for the other two bottles.

Step 2

- Place the three bottles into the freezer and leave overnight until the water is completely frozen.

Step 3

- Remove the bottles from the freezer.
- Cover one bottle with bubble wrap, one with newspaper and one with aluminium foil. Do not cover the lid.
- Remove the lid from each bottle.

Step 4

- Gently place each bottle upside-down on top of a drinking glass.
- When all three bottles are in place, start the stopwatch.

Step 5

- After 30 minutes, carefully pour any water collected from the bottle wrapped in bubble wrap into the medicine glass.
- Place the bottle upside-down on top of the drinking glass again.
- Record the amount of water collected in the recording table.
- Repeat for the other two bottles.

Step 6

- Repeat Step 5 after another 30 minutes (a total of 60 minutes or 1 hour).
- Repeat Step 5 again after a further 30 minutes (a total of 90 minutes or 1 ½ hours).

Section 3. Recording results

Results *A record of the data you collect during the investigation.*

1. Write the volume of water you collect at 30 minutes, 60 minutes and 90 minutes in the table below.

	30 minutes	60 minutes	90 minutes
Volume of water collected from the bottle wrapped in **bubble wrap** (mL)			
Volume of water collected from the bottle wrapped in **newspaper** (mL)			
Volume of water collected from the bottle wrapped in **aluminium foil** (mL)			

2. You need to find out how much water was collected from each bottle **in total**. To do this, you need to add the three water measurements for each bottle.

Bottle wrapped in **bubble wrap:**

..... mL + …… mL + …… mL = …… mL in total

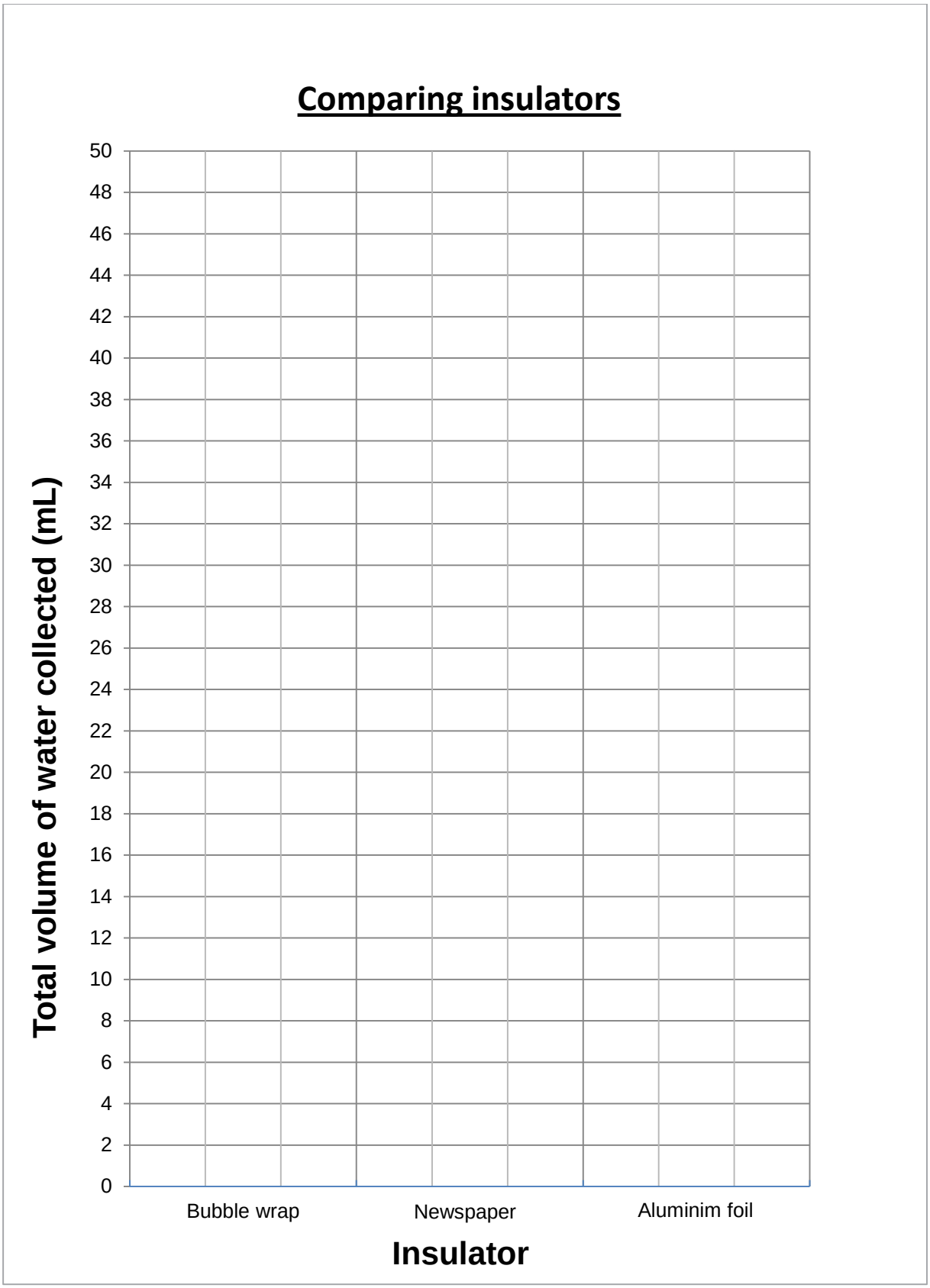
Bottle wrapped in **newspaper:**

..... mL + …… mL + …… mL = …… mL in total

Bottle wrapped in **aluminium foil:**

..... mL + …… mL + …… mL = …… mL in total

3. Draw a column graph to show the total volume of water collected from each of the three insulated bottles.



Section 4. Explaining your results

Discussion *Describe and explain your results.*

1. Which insulator kept the ice solid for longer?

   Use the evidence from the results tables and the column graph to explain how you know this.

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   .....

2. Why do you think this insulator was the best at keeping the ice solid?

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   .....

3. Which insulator caused the ice to melt most quickly?

   Use the evidence from the results tables and the column graph to explain how you know this.

   .....

   .....

   .....

4. Why do you think this insulator caused the ice to melt most quickly?

   .....

   .....

5. Was your prediction correct? (Circle one)

   Yes / No

Conclusion *Answer the investigation question.*

6. Choose the correct words from the word bank to complete the passage.
   You will **not** need to use all of the words.

heat	bubble wrap	liquid	less	freeze
newspaper	more	solid	melt	aluminim foil

The ..... was the best insulator because it kept the ice in a ..... state for longer. This is because it allowed ..... heat to enter the plastic bottle.

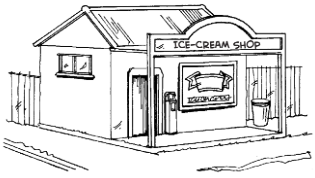
The ..... was the worst insulator because the ice turned into a ..... state more quickly. This is because it allowed more ..... to enter the plastic bottle which caused the ice to ..... .

Section 5. Applying your science knowledge

In this investigation, we discovered which insulator will keep ice solid for longer.

Insulators can slow down the change of a substance from a solid state to a liquid state. They can also help to keep things cold.

7. Describe how and why (explain) the science knoweldge you have learned in this investigation might be helpful in **one** of the following real-life situations.

		
Keeping drinks cool at a party	Stopping an ice-cream from melting	Keeping vegetables fresh on a camping trip

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Cool it!

Name .....

Purpose of assessment: To conduct an investigation to determine which insulator will keep ice solid for longer.

Understanding dimension	Skills dimension			
Science Understanding **Science as a Human Endeavour**	**Questioning and predicting** **Planning and conducting**	**Processing and analysing data and information**	**Communicating**	
Section 4: Explaining your results — Conclusion Explanation of observations by completing the cloze exercise to show the correct relationship between insulators, change of state and heat **Section 5: Applying science knowledge** Application of science knowledge to identify where and describe how and why people use insulation to prevent heat transference in a real-life situation	**Section 1: Making predictions** Prediction about which insulator will keep ice solid for longer **Section 3: Recording results** Collection and recording of data in the results tables	**Section 3: Recording results** **Section 4: Explaining your results — Discussion** Presentation of collected data to draw a column graph and use of the data in the results tables and column graph to explain findings	**Sections 1, 3, 4, 5** Communication of ideas and findings in a variety of ways (short responses, tables, column graph, cloze passage)	
◀ Use of science understanding to suggest reasoned explanation of observations by completing the cloze exercise to show the correct relationship between the insulators, change of state of water and the amount of heat Identification of where and description of how and why people use insulation to prevent heat transference in a real-life situation	◀ Reasoned prediction about which insulator will keep ice solid for longer Systematic collection and recording of reliable data in the tables	◀ Following of procedures to present collected data in a column graph to identify which insulator keeps ice solid for longer by explaining patterns and trends when suggesting possible reasons linked to science knowledge for choice of best insulator	◀ Coherent communication of ideas and findings about change of state from solid to liquid and insulators ideas using relevant science terminology	**A** **B**
◀ Use of science understanding to suggest an explanation of observations by completing the cloze exercise to show the correct relationship between insulators and the amount of heat entering the plastic bottle Identification of where people use insulation to prevent heat transference in a real-life situation	◀ Prediction about which insulator will keep ice solid for longer Collection and recording of data in the tables	◀ Following of procedures to present collected data in a column graph to identify which insulator keeps ice solid for longer and suggestion of a possible reason for choice of best insulator	◀ Communication of ideas and findings about change of state from solid to liquid and insulators	**C** **D**
◀ Isolated placement of words from the word bank into the cloze exercise Recall of information about insulation or heat transfer	◀ Restatement of the investigation question Directed collection of observations	◀ Fragmented presentation of observations/data	◀ Fragmented communication of ideas and findings about change of state from solid to liquid and insulators	**E**

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Cool it!

Name .....

Purpose of assessment: To conduct an investigation to determine which insulator will keep ice solid for longer.

			A	B	C	D	E
Understanding dimension	Science Understanding	**Section 4: Explaining your results — Conclusion** Explanation of observations by completing the cloze exercise to show the correct relationship between insulators, change of state and heat	Use of science understanding to suggest a reasoned explanation of observations by completing the cloze exercise to show the correct relationship between the insulators, change of state of water, and the amount of heat	Use of science understanding to suggest an informed explanation of observations by completing the cloze exercise to show the correct relationship between the insulators and the change of state of water	Use of science understanding to suggest an explanation of observations by completing the cloze exercise to show the correct relationship between the insulators and the amount of heat entering the plastic bottle	Use of science information to provide a partial explanation of observations in the cloze exercise to show the correct relationship between one insulator and the amount of heat entering the plastic bottle	Isolated placement of words from the word bank into the cloze exercise
	Science as a Human Endeavour	**Section 5: Applying science knowledge** Application of science knowledge to identify where and describe how and why people use insulation to prevent heat transference in a real-life situation	Identification of where and description of how and why people use insulation to prevent heat transference in a real-life situation	Identification of where and description of how people use insulation to prevent heat transference in a real-life situation	Identification of where people use insulation to prevent heat transference in a real-life situation	Statements about insulation preventing heat transfer	Recall of information about insulation or heat transfer
Skills dimension	Questioning and predicting	**Section 1: Making predictions** Prediction about which insulator will keep ice solid for longer	Reasoned prediction about which insulator will keep ice solid for longer	Plausible prediction about which insulator will keep ice solid for longer	Prediction about which insulator will keep ice solid for longer	Guided prediction about which insulator will keep ice solid for longer	Restatement of the investigation question
	Planning and conducting	**Section 3: Recording results** Collection and recording of data in the results tables	Systematic collection and recording of reliable data in the results tables	Systematic collection and recording of relevant data in the results tables	Collection and recording of data in the results tables	Partial collection and partial recording of data in the results tables	Directed collection of data

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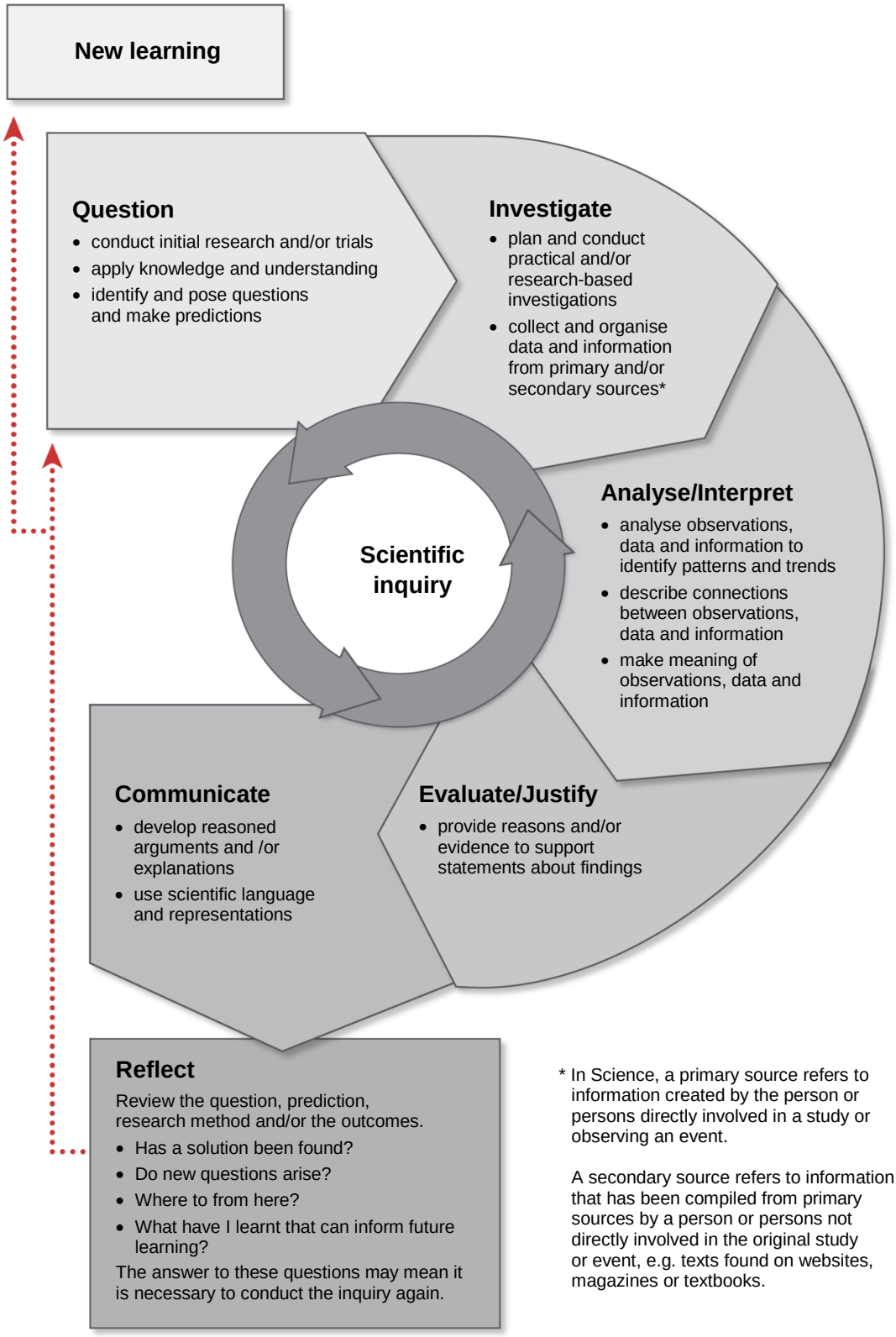
Cool it!

Name .....

			A	B	C	D	E
Skills dimension	Processing and analysing data and information	**Section 3: Recording results** **Section 4: Explaining your results — Discussion** Presentation of collected data in a column graph and use of the data in the results tables and column graph to explain findings	Following of procedures to present collected data in a column graph to identify which insulator keeps ice solid for longer by explaining patterns and trends when suggesting possible reasons linked to science knowledge for choice of best insulator	Following of procedures to present collected data in a column graph to identify which insulator keeps ice solid for longer by describing patterns and trends when suggesting possible reasons for choice of best insulator	Following of procedures to present collected data in a column graph to identify which insulator keeps ice solid for longer and suggestion of a possible reason for choice of best insulator	Presentation of observations/data and partial development of a reason for choice of best insulator	Fragmented presentation of observations/data
	Communicating	**Sections 1, 3, 4, 5** Communication of ideas and findings in a variety of ways (short responses, tables, column graph, cloze passage)	Coherent communication of ideas and findings about change of state from solid to liquid and insulators using relevant science terminology	Communication of ideas and findings about change of state from solid to liquid and insulators using relevant science terminology	Communication of ideas and findings about change of state from solid to liquid and insulators	Communication of ideas and findings about change of state from solid to liquid and insulators using everyday language	Fragmented communication of ideas and findings about change of state from solid to liquid and insulators

Cool it!

Scientific inquiry process: Years 3 and 4



* In Science, a primary source refers to information created by the person or persons directly involved in a study or observing an event.

A secondary source refers to information that has been compiled from primary sources by a person or persons not directly involved in the original study or event, e.g. texts found on websites, magazines or textbooks.