

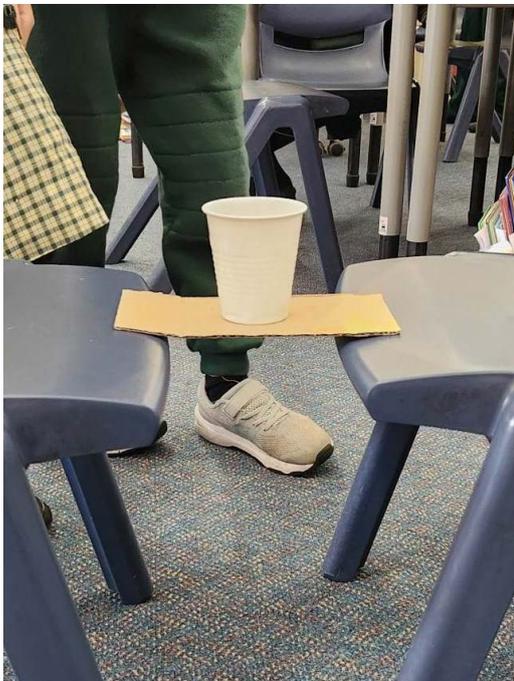
# Science Inquiry Task

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## Level 1 Task B

### Ordering Objects by Strength!

This is a guided task that provides students with the opportunity to order objects by their strength. Using a range of sheets made from different materials and a collection of weights, students will conduct a test that will allow them to order the sheets according to their strength. Teachers are to maintain a strong emphasis on fair testing and fair comparisons. The inquiry skills of focus here are, 'Questioning and Predicting', 'Recording and Processing', and 'Communicating'.



# Science Inquiry Assessment – An Introduction to the SIAs

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Science inquiry is increasingly recognised as a critically important aspect of a science education. Students need not only to be introduced to the concepts of science through which we understand the world, but also to the inquiry practices through which science has investigated and established this knowledge. For students to be literate in interpreting and using science in their lives, they need to be aware of how science operates. This is increasingly important in these times of unlimited access to social media and the fake news that can be promoted.

Often, with practical activities in science, the focus is on illustrating concepts without special attention to developing investigative practices. Even with activities where students develop their own inquiries or aspects of these, the particular inquiry practices are often neither independently focused on nor assessed, reducing the opportunity to systematically develop students' capabilities with inquiry.

These inquiry assessment tasks have three aims:

- 1. To help teachers and students clarify the meaning of different aspects of science inquiry practices; what these involve and how they might be recognised and assessed as a progression. They can help develop for teachers a language to discuss science inquiry practices and outcomes.*
- 2. To provide the tools for assessing student inquiry at different points in the primary years. These can be used to track student inquiry learning over time.*
- 3. To provide exemplar inquiry activities that can develop students' inquiry practices in contexts that engage their interest. These can be used to stimulate the development of further inquiry activities in a range of topics.*

## Using the tasks:

The tasks are designed to be used independently of curriculum units, matched to different year levels and covering a range of inquiry practices.

However:

- They can be matched to curriculum topics by utilising them flexibly at different year levels. Most could be adapted to focus on skills at higher or lower levels.*
- Tasks are designed to focus on three of the science inquiry skills. However, they can be adapted to focus on other skills and, depending on the assessment processes used, one or two skills might be of particular focus. For the Grade 6 tasks, rubrics are produced for all 5 inquiry skills but teachers would preferably choose from these rather than attempt to track them all.*
- Assessment can involve multiple data sources: field notes as students' work on tasks; notes on student productions; students' answers to questions; and presentations of group reports.*
- The tasks and advice to teachers assume that teachers interact with students to scaffold their inquiries but make judgments about the extent of support needed. Similarly, they are group tasks but students report individually, so that judgments need to be made about the role of each student in a group.*
- The tasks are designed around activities that are intrinsically captivating for students, but this depends on teachers constructing a narrative to bring these to life. For this, open questioning and introductory discussions to provide ways into the activity are important.*
- Teachers need to make judgments about the nature and specificity of the introductory discussions to support students to the point where they can productively engage with the tasks. The support for students may be at this whole class level, but during the tasks also tailored to particular students and groups so that ideally each student works at their own level. This support might be through targeted questioning, modelling, or suggestions and encouragement to pursue specific directions.*
- Prior to engaging with the tasks teachers need to be clear about its purposes and the levels of student inquiry practices that could be encouraged/engaged with. Students will of course come up with surprising and inventive ideas, and care should be taken to not constrain these possibilities.*

## Level 1 Task B: Ordering Objects by Strength!

### Task Summary:

This is a guided task that provides students with the opportunity to order objects by their strength. Using a range of sheets made from different materials and a collection of weights, students will conduct a test that will allow them to order the sheets according to their strength. Teachers are to maintain a strong emphasis on fair testing and fair comparisons. The inquiry skills of focus here are, 'Questioning and Predicting', 'Recording and Processing', and 'Communicating'.

### Question for investigation:

Can you order materials by how strong they are?

### Equipment list and preparation:

The list for this task is as follows:

	EQUIPMENT	DESCRIPTION
	Collection of sheets of similar size and shape, but different materials and strengths	10cm x 20cm, e.g. plastic, wood, cardboard, paper.
	Collection of blocks and 'weights'	To be used for testing. e.g. stones, marbles in a cup.
	Two objects between which the sheets will suspend	e.g. two desks; two blocks; two chairs, etc. See included photos for visual example.
	A ramp	A book leaning against a box.

Some guidance is needed to demonstrate how the objects can be suspended- longitudinally across a 10cm span between, for example, two desks or two blocks or two chairs. The sheet needs to provide a horizontal span across a 10cm gap. This allows a 5cm overhang on each side. The sheets to be tested are suspended across the gap, and weights added, gradually, to the centre of the span. The material is then observed for its strength.

The teacher should demonstrate the task and show how to add weights to the bridge.

### Conducting the task:

Included in the online materials are PowerPoint slides that can be used to introduce and guide the students through the assessment. Students perform the investigation in groups but report individually. Put the different sheets (of similar size and shape) in front of the students.

Use the following questions and prompts to guide students through the investigation:

Q1. *"If you were to build the strongest bridge you can, from these materials, which one would you choose and why?"*

Prompt (if required) — Which is the strongest? How do you know? Observe how students discuss the task and how they propose to test their ideas.

Q2. *"How can you test which one is the strongest?"*

Discuss with students how they might approach this but allow freedom for them to carry out the test.

Q3. *"How many marbles did the paper bridge hold?"*

Q4. *"Can you show your results? Which would you use for the bridge?"*

Q5. *"Can you put them in order of strength?"*

Q6. *"Is this same as what you predicted? Why do the materials have different strength?"*

### Gathering evidence:

Students could present their results by taking photos or drawing the objects to show their observations. Students may present their ranking verbally or in written/pictorial form. Verbal or written statements could provide evidence of student's reasoning for their ranking. A student may include reference to the relative strength and some may even include this in their representation.

There are two (2) scoring options for the inquiry task. The Group Scoring Template rubric is designed to assess the skills observed by each group. The Class Grid rubric is to record the skills of each student within the class.

## Level 1 Task B: Student Work Samples

### My prediction

Order each sheet based on how strong you think it is. You can choose to write or draw your ranking in the box.

weakest  $\longrightarrow$  strongest

paper plastic card cardboard

**Medium-high** Clear indication of predicted order and tallying of weights.

### My results

Use the space in the box below to show your results. For example, you can list or draw the objects in order of their actual strength.

cardboard card plastic paper

|||| | ||| | ||| | ||| || | ||| | |

|||| | ||| | ||| | ||| || | ||| | |

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**Medium-high** Clear indication of predicted order and tallying of weights.

**My results**

Use the space in the box below to show your results. For example, you can list or draw the objects in order of their actual strength.

Now we no that the cardboard was the strongest because we put 45 on it.

strongest	2nd	strongest
cardboard		card
45		7
2nd weakest		weakest
plastic		Paper
6		0

**Medium-high** Clear ranking and presentation of data.

**My results**

Use the space in the box below to show your results. For example, you can list or draw the objects in order of their actual strength.

The cardboard hold all of the stuff without falling.

**Low** Has included an interpretation of results but no data.

**My prediction**

Order each sheet based on how strong you think it is. You can choose to write or draw your ranking in the box.

A hand-drawn diagram within a dashed rectangular box. On the left side, the words "Weakest" and "Plastic" are written in a cursive-like font. A horizontal arrow points from the right side of "Plastic" towards the right side of the box. On the right side of the box, the words "Strongest" and "cardboard" are written in a similar cursive-like font.

**Low-medium** Engages with question but incompletely, as not all materials are included.

## Level 1 Task B: Ordering Objects by Strength!

### 1 Predicting

Look at the different sheets that have been given to your group.

Which material do you think is the strongest?  
How do you know?

Can you order each sheet based on how strong you think it is?

### 2 Planning

What are some different ways we can show our results?

### 3 Recording

List the sheets in order of strength.

### 4 Discussing

Is this order the same as what you predicted? Why?



## Level 1 Task B: Ordering Objects by Strength!

Name: \_\_\_\_\_

Carefully look at the objects that have been given to your group.

Q1. What is your goal for this task? What are you trying to do?

### My prediction

Q2. Order each sheet based on how strong you think it is. You can choose to write or draw your ranking in the box.

**My results**

Q3. Use the space in the box below to show your results. For example, you can list or draw the objects in order of their actual strength..

**My discussion**

Q4. Why do the materials have different strength?

# Group Scoring Template

Choose the appropriate outcome/s to focus your assessment on. It may be possible to assess three outcomes for some students or you may choose to use two or one outcome to assess the entire class.  
*Suggested use:* student initials and notes can be recorded in the space for each outcome/level.

Victorian Curriculum Level F-2		
Beginning	Working Toward	Achieved (F-2)
<b>Questioning &amp; Predicting</b>		
<p><i>Actively joins in activity but has difficulty responding to the questions being asked</i></p>	<p>Actively joins in exploration of familiar objects and events.  <i>Engages productively with questions about similarities and differences but lacks flexibility in organising.</i></p>	<p>Responds to and poses questions, and makes predictions about familiar objects and events.  <i>Speculates imaginatively about possible differences in strength and reasons for this.</i></p>
<b>Recording &amp; Processing</b>		
<p>Has difficulty in recording measurements and observations or sorting information.  <i>Has difficulty in recording order of predictions and results without strong guidance.</i></p>	<p>Use pictures, words and provided simple graphic organisers to record observations and findings and sort objects into groups based on particular characteristics.  <i>Records the order of materials for the prediction and results with guidance. Needs significant guidance to represent relative strengths.</i></p>	<p>Uses informal measurements in the collection and recording of observations. Uses a range of methods, including drawings and provided tables, to sort information  <i>Competently records the order of materials' strength and with guidance, represents relative strengths in informal measures.</i></p>

## Group Scoring Template (cont.)

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Communicating		
<p>Has difficulty in describing observations.</p> <p><i>With significant support, describes the differences in strength of materials and what this implies.</i></p>	<p>Uses both general terms and simple, scientific vocabulary to begin to describe their activities and observation.</p> <p><i>With support, describes the purpose and outcomes of the experiment.</i></p>	<p>Represents and communicates observations and ideas about changes in objects and events in a variety of ways.</p> <p><i>Articulates differences in strength of materials, and possible reasons for this.</i></p>



