Physics 2019 v1.2

Unit 2 sample assessment instrument

August 2018

Student experiment

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Schools develop internal assessments for each senior subject, based on the learning described in Units 1 and 2 of the subject syllabus. Each unit objective must be assessed at least once.

Unit objectives

This assessment instrument is used to determine student achievement in the following objectives:

2. apply understanding of linear motion and force, or waves
3. analyse evidence about linear motion and force, or waves
4. interpret evidence about linear motion and force, or waves
5. investigate phenomena associated with linear motion and force, or waves
6. evaluate processes, claims and conclusions about linear motion and force, or waves
7. communicate understandings, findings, arguments and conclusions about linear motion and force, or waves.

Note: Objective 1 is not assessed in this instrument.

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For all Queensland schools

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Subject	Physics		
Technique	Student experiment		
Unit	Unit 2: Linear motion and waves		
Topic	Topic 1: Linear motion and force Topic 2: Waves		
Conditions			
Duration	10 hours class time		
Mode	Written response — scientific report	**Length**	1500–2000 words
Individual/ group	Group work with individual report	**Other**	—
Resources available	School science laboratory and library (online: internet and school intranet, databases, journals)		

Context

You have completed the following practicals in class:

- Verify the value of acceleration due to gravity on the Earth's surface.
- Determine the refractive index of a transparent substance.
- Verify the law of reflection.
- Calculate the speed of sound in air at a specific temperature.

Task

Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or research question.

You may use a practical performed in class, a related simulation or another practical related to Unit 2 (as negotiated with your teacher) as the basis for your methodology and research question.

To complete this task, you must:

- identify an experiment to modify*
- develop a research question to be investigated*
- research relevant background scientific information to inform the modification of the research question and methodology
- conduct a risk assessment and account for risks in the methodology*
- conduct the experiment*
- collect sufficient and relevant qualitative and/or quantitative data to address the research question*
- process and present the data appropriately
- analyse the evidence to identify trends, patterns or relationships
- analyse the evidence to identify uncertainty and limitations
- interpret the evidence to draw conclusion/s to the research question
- evaluate the reliability and validity of the experimental process
- suggest possible improvements and extensions to the experiment
- communicate findings in an appropriate scientific genre, i.e. scientific report.

* The steps indicated with an asterisk above may be completed in groups. All other elements must be completed individually.

Stimulus

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Checkpoints
☐ Week 1: Select experiment and identify proposed modifications.
☐ Week 2: Perform experiment and process data.
☐ Week 4: Analyse and evaluate evidence.
☐ Week 5: Submit draft.
☐ Week 6: Submit final response.
Feedback
Authentication strategies
• The teacher will provide class time for task completion.
• Students will provide documentation of their progress at indicated checkpoints.
• The teacher will collect and annotate drafts.
• Students will use plagiarism-detection software at submission of the response.
• Students must acknowledge all sources.
• The teacher will compare the responses of students who have worked together in groups.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific report) and contain:

- a research question
- a rationale for the experiment
- reference to the initial experiment and identification and justification of modifications to the methodology
- raw and processed qualitative and/or quantitative data
- an analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions for improvements and extensions to the experiment
- a reference list.

An example of how one of the practicals could be modified to develop a research question

Practical that will be modified: Calculate the speed of sound in air at a specific temperature.

Research question: What is the relationship between the speed of sound in air and the temperature of the air when measured in a 2 m long, 10 cm diameter PVC pipe using a 1500 Hz sound source?

Developing the research question:

Description	Example
Identify the independent variable to be investigated.	Air temperature in the PVC pipe
Identify the dependent variable.	Speed of sound in the PVC pipe

Identify the methodology to be used.	• Sound recording software that can also generate a sound will be set up.
	  – The speaker will be sealed at one end of the PVC pipe and a microphone sealed at the other.
	  – The software will be used to both generate a sound through the speaker and record the sound at the other end of the pipe.
	• The temperature of the air within the pipe will be adjusted by placing the pipe in environments with different temperatures.
	• The temperature will be measured through a sealable hole in the pipe.

Draft research questions.	What is the relationship between the speed of sound in air and the air temperature?
Refine and focus the research question.	What is the relationship between the speed of sound in air and the temperature of the air when measured in a 2 m long, 10 cm diameter PVC pipe using a 1500 Hz sound source?

Note: You cannot use this sample research question for your experiment.