

Chemistry 2019 v1.3

Units 1 and 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 the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions
3. analyse evidence about the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions
4. interpret evidence about the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions
5. investigate phenomena associated with the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions
6. evaluate processes, claims and conclusions about the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions
7. communicate understandings, findings, arguments and conclusions about the properties and structure of materials; intermolecular forces and gases; aqueous solutions and acidity; and rates of chemical reactions

Note: Objective 1 is not assessed in this instrument.

Subject	Chemistry		
Technique	Student experiment		
Unit	Unit 1: Chemical fundamentals — structure, properties and reactions Unit 2: Molecular interactions and reactions		
Topic	Unit 1 Topic 2: Properties and structure of materials Unit 2 Topic 1: Intermolecular forces and gases Unit 2 Topic 2: Aqueous solutions and acidity Unit 2 Topic 3: Rates of chemical reactions		
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			
<p>You have completed the following practicals in class:</p> <ul style="list-style-type: none"> • Suggested practical: Investigate the concentration of a solution. <ul style="list-style-type: none"> – Simulation: Concentration – Simulation: Molarity • Suggested practical: Investigate the effect of temperature on solubility. <ul style="list-style-type: none"> – Activity: Investigate the relationship between solubility and bonding. – Simulation: Salts and solubility – Simulation: Sugar and salt solutions • Suggested practical: How is the solubility of a compound determined? • Mandatory practical: Precipitation reactions to identify cations and anions. • Suggested practical: Separate the components of a mixture using paper chromatography and/or thin layer chromatography (TLC). 			
Task			
<p>Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question.</p> <p>You may use a practical performed in class, a related simulation, suggested research or another practical related to Unit 1 Topic 2 or Unit 2 Topics 1–3 (as negotiated with your teacher) as the basis for your methodology and research question.</p>			

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 will be completed in groups. All other elements must be completed individually.

Stimulus

—

Checkpoints

- Term 2 Week 3: Select experiment and identify proposed modifications.
- Term 2 Week 4: Perform experiment and process data.
- Term 2 Week 6: Analyse and evaluate evidence.
- Term 2 Week 7: Submit draft.
- Term 2 Week 9: 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
- analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions of 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: Investigate the effect of temperature on solubility.

Research question: What effect does pH have on the solubility (and mass of precipitate formed) of calcium carbonate in aqueous solutions?

Developing the research question:

Description	Example
Identify the independent variable to be investigated	pH of calcium carbonate solution
Identify the dependent variable	mass of precipitate formed
Identify the methodology to be used	precipitation reactions to form insoluble salt at pH 7
Draft research questions	What effect does pH have on solubility?
Refine and focus the research question	<ul style="list-style-type: none">• What substances are being investigated for their solubility? (Salts which are sparingly soluble or insoluble in water at pH 7)• How will solubility be measured? (Mass of precipitate formed)
Present research question to teacher for approval	What effect does pH have on the solubility (and mass of precipitate formed) of calcium carbonate in aqueous solutions?

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