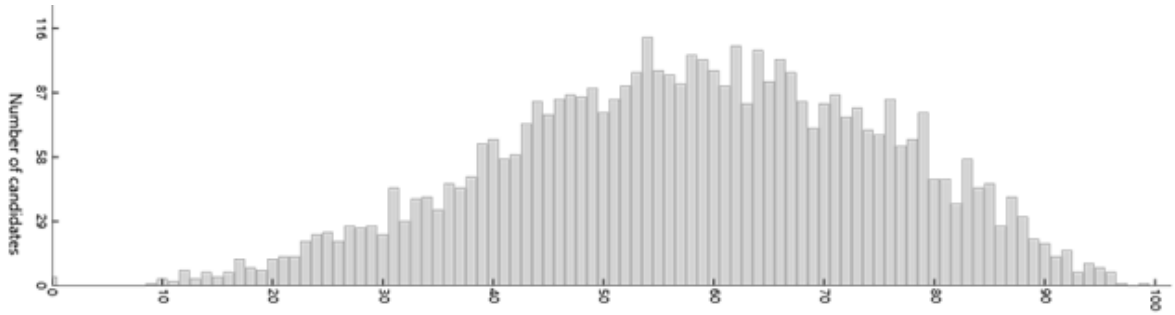
Government of **Western Australia**
School Curriculum and Standards Authority

Summary report of the 2019 ATAR course examination: Chemistry

Year	Number who sat	Number of absentees
2019	4547	66
2018	4965	50
2017	5007	54
2016	4997	57

Examination score distribution–Written



Summary

All examination questions were answerable by candidates and the paper functioned well to discriminate between the candidate's ability. There was a good mix of application questions and straightforward questions. Individual questions varied in difficulty, allowing weaker candidates to offer a response and gain some marks while stronger candidates could work through questions and gain full marks.

The examination incorporated questions about experimental practice and techniques. Questions were framed in real world contexts that were authentic, interesting and original giving candidates the opportunity to apply their knowledge to novel situations.

Attempted by 4547 candidates	Mean 57.84%	Max 98.51%	Min 0.00%

Section unadjusted means were:			
Section One: Multiple-choice	Mean 67.54%		
Attempted by 4547 candidates	Mean 16.88(/25)	Max 25.00	Min 0.00
Section Two: Short answer	Mean 52.39%		
Attempted by 4538 candidates	Mean 18.34(/35)	Max 32.36	Min 0.00
Section Three: Extended answer	Mean 44.34%		
Attempted by 4527 candidates	Mean 17.74(/40)	Max 37.80	Min 0.00

General comments

Teacher and candidate feedback, together with the lower-than-normal mean, indicated that the examination was too long. While full marks were attained by candidates for Section One, no candidate scored full marks in Sections Two and Three. To address these issue candidates' examination marks were adjusted by the addition of five marks, resulting in an adjusted mean of 57.84 that is consistent with mean marks achieved by candidates in previous years.

Questions 34(b), 37(a), 37(e) and 41(d) seemed to cause some candidates difficulty in achieving full marks. These were non-scaffolded questions, which required a thorough understanding of the concepts and organisation of relevant information to answer the questions satisfactorily.

Candidates tried to explain the effects on systems using Le Châtelier's Principle (LCP). This is a predicting tool and cannot be used as an explanation. Question 36(f) explicitly stated to use LCP to demonstrate the effect of excessively high blood pH. When required to explain aspects of equilibrium in Questions 36(g) and 37(e), candidates were required to use Collision Theory and rates of reaction.

Many candidates demonstrated good numerical skills and generally showed working out in calculations clearly. A common error was the appearance of numbers without specifying what they represented or how they were calculated.

Advice for candidates

- The examination questions are based on the syllabus. Use the syllabus as your check list.
- Do not expect the examination to contain similar or standard questions from year to year. While assessing the same syllabus, expect a range of difficulty and different types of questions, often reflecting authentic chemistry contexts.
- Unless using a key, an examination is not the place for using abbreviations or acronyms.
- Use the appropriate units and express numerical answers to the appropriate significant figures.
- Answer using the terms requested in the question (e.g. if asked for a name, give the name; if asked for a symbol/formula, give the symbol/formula).
- Be conversant with the terms used in the syllabus.
- Understand the differences between related concepts, such as
    - intermolecular force and intramolecular force
    - equivalence point and end point
    - ionisation and dissociation
    - concentrate/dilute and strong/weak.
- Practise writing clear, concise and coherent explanations and justifications. Incorporate equations and labelled diagrams that are clear and relevant.
- Be familiar with the content of the Data Booklet.
- Whenever a colour for a chemical species is provided within the Data Booklet, this is the colour that must be used to describe that species in the examination.
- Use the given formula to determine the nature and bonding of a substance and all its intermolecular forces.
- Be familiar and express clearly the expected observations and inferences that can be made for the reactions indicated in the syllabus.
- Solutions are clear; some are colourless and some exhibit a colour. For example, copper sulfate solution is blue, while sodium sulfate solution is colourless; both are clear because they are solutions.
- Practise writing equations, providing the appropriate formula and state symbols for only those species that are taking part in the reaction unless otherwise directed.
- Do not personify chemical species or processes. For example, detergent molecules do not 'swarm around grease' and something that is described as 'hydrophilic' or 'hydrophobic' does not really 'love' or 'hate' water. Instead, describe the relative inter/intra-molecular forces present.
- Practise writing legibly and setting out your work so it is easy to read and follow.

Advice for teachers

- Familiarise students with the general instructions, structure, and requirements of the examination before the examination period.
- Practise reading to identify relevant information and what is required from each question.
- Help students to develop a strategy to answer questions (e.g. firstly attempt questions that can be answered correctly and quickly).
- Guide students about the depth of answer by using the:
    - key word (state, list, outline, explain, illustrate with a diagram etc.)
    - … about this system (specific) or about these systems (general) …
    - number of marks allocated and space provided for the answer.
- Ensure coverage of all syllabus dot points. The entire syllabus is not necessarily examined in any one examination, but should be expected to be assessed in its entirety over the course of a few years. Some syllabus dot points are examined regularly as they are essential for the understanding and communication of chemical concepts and processes.
- Prepare candidates to expect the examination to contain a range of question types, often reflecting authentic chemistry contexts.
- Teach efficient and critical reading of information to extract and understand the relevant information.
- Engage students in conducting relevant experiments and problem solving. Candidates often struggle to apply knowledge of common laboratory procedures.
- Insist that students use the appropriate units and express numerical answers to the appropriate significant figures, unless otherwise directed.
- Provide students with practise in writing extended answers, justifications and explanations; incorporating illustrative diagrams that are clear, labelled and relevant.
- Encourage students to set out their working and reasoning clearly; full marks are not awarded unless it is clear how the answer was obtained and the relevant chemical ideas (such as relevant mole ratios) are shown.
- Teach students to recognise that molecules might exhibit more than one type of intermolecular force and the attraction between molecules is the result of the cumulative effect of all intermolecular forces. While existing between an atom pair, a hydrogen bond is stronger than a dipole-dipole bond which is stronger than a dispersion force, but, with few exceptions, the cumulative dispersion forces is often the predominant intermolecular force present.
- Whenever a colour for a compound or ion in solution is provided within the Data Booklet, this is the colour that must be used when answering questions in the examination.

Comments on specific sections and questions

Section One: Multiple-choice (25 Marks)

The easiest questions were Questions 4, 17, 19, 20 and 24 with more than 80% of candidates answering these questions correctly. The most challenging questions were Questions 8 and 12. In Question 8, it appears that candidates confused concepts of concentration and strength when referring to solutions of acids. Question 12 also served to discriminate the most capable candidates with most failing to recognise gases other than carbon dioxide as a greenhouse gas.

Section Two: Short answer (106 Marks)

Generally, most candidates did well in this section with the stronger candidates showing a good understanding of chemistry concepts. The mean of 52.39% was similar to 2018.

Section Three: Extended answer (109 Marks)

The mean of 44.34% was lower than previous years. Stronger candidates showed a good understanding of chemistry concepts.