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# How to use this book

The *Pearson Chemistry 12 Queensland Skills and Assessment* book takes an intuitive, self-paced approach to science education that ensures every student has opportunities to practise, apply and extend their learning through a range of supportive and challenging activities.

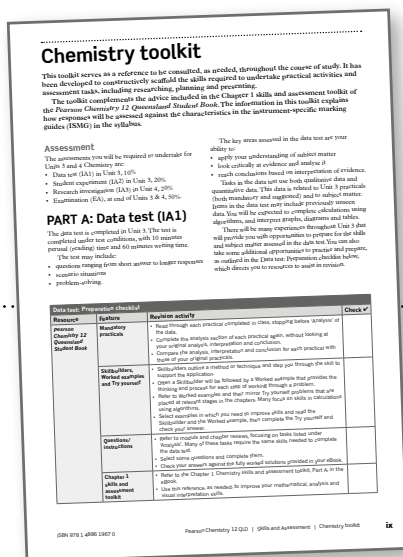
This resource has been developed by highly experienced and expert author teams, with leading Queensland specialists who have a working understanding of what teachers are looking for to support teaching and learning across the new Queensland Certificate of Education (QCE).

Fully written to the new QCAA Chemistry 2019 General Senior Syllabus, the skills and assessment book is organised by units, with the unit opener outlining the unit objectives that are addressed. The skills and assessment book is further organised into topics. Each topic addresses all of the subject matter and mandatory practicals from the syllabus.

All activities are closely linked to the material in the *Pearson Chemistry 12 Queensland Student Book*, creating a complete teaching, learning and assessment program. At the same time, the skills and assessment book has been designed so that it can be used independently of the student book, providing flexibility in the manner students and teachers are able to engage with it.

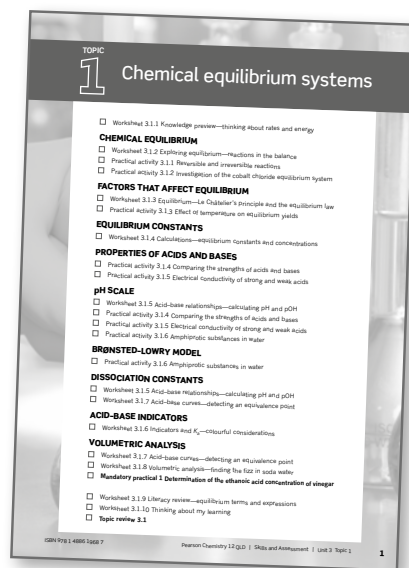
## TOOLKIT

A complementary toolkit supports development of the skills and techniques needed to undertake practical investigations, as well as the data test, student experiment and research investigation. It also includes checklists and helpful hints to assist in fulfilling all assessment requirements and to support further development of study skills.



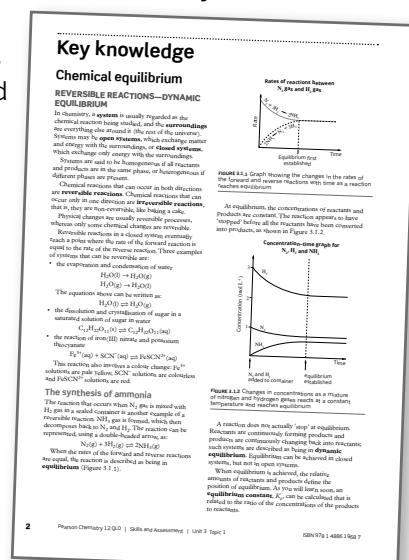
## TOPIC OPENER

The book is split into two units with two topics per unit, as per the syllabus. While the unit opener provides an overview of the syllabus outcomes for each unit, the topic opener gives a succinct overview of the content in the book for each topic, organised by key content area. Each topic opener is presented in a handy checklist format to allow you to track your progress.



## KEY KNOWLEDGE

Each topic begins with a key knowledge section. The key knowledge consists of a set of succinct summary notes that cover the subject matter for each topic of the syllabus. This section is highly illustrative and written in a straightforward style to assist students of all abilities in focusing on the salient points. Key terms are bolded for ease of navigation and are reflected in the student book glossary. The key knowledge also serves as a ready reference when completing worksheets and practical activities, and provides a handy set of revision and study notes.



## WORKSHEETS

A diverse offering of instructive and self-contained worksheets is included in each topic. Common to all topics are the initial 'Knowledge preview' worksheets to activate prior knowledge; a 'Literacy review' worksheet to explicitly build language and application of scientific terminology; and finally, a 'Thinking about my learning' worksheet, which encourages students to reflect on their learning and identify areas for improvement. Other worksheets, with their range of activities and tasks, focus on application of subject matter to assist in the consolidation of learning and the making of connections between subject matter.

Worksheets may be used as formative assessment and are clearly aligned to the syllabus. A range of questions, building from foundation to challenging, are included in the worksheets, which are written to reflect the Marzano and Kendall taxonomy instructional verbs.

### WORKSHEET 3.1.1

#### Knowledge preview—thinking about rates and energy

1 Identify the correct term for each definition by completing the following table. This will help you check your knowledge and understanding of the key ideas involved in rates of reaction and energy of reaction in preparation for your study of equilibrium.

Definition	Correct term
The energy needed to break the bonds between atoms in the reactants to create a reaction is called:	
The part of the universe being studied:	
The name for a theory that accounts for the rates of chemical reactions:	
A system in which only energy is exchanged with the surroundings:	
A substance that increases the rate of reaction but is not consumed in the reaction:	
A chemical reaction in which all the species are in the same phase:	
A reaction in which equilibrium reaction can occur in the reverse direction:	
A reaction that releases energy to the surroundings:	
The netting for a chemical reaction that includes the enthalpy change of the reaction:	
A reaction for which the $\Delta H$ is positive:	

2 Define the following terms to check your knowledge and understanding of the key ideas involving in acid-base titrations and the dilution of solutions.

Weak acid:

Strong base:

Dilute solution:

Concentrated solution:

3 Show the balanced equations for the reactions that occur when the following substances dissolve in water. Include the state of matter in the equations.

HCl(g)

NaOH(s)

NH<sub>3</sub>(g)

CH<sub>3</sub>COOH(l)

4 Select the statements about standard solutions that are true.

- A standard solution has an accurately known concentration.
- A standard solution always has a neutral pH.
- A standard solution always has a concentration of 1.0 mol L<sup>-1</sup>.
- A standard solution can have any concentration, as long as it is accurately known.

### PRACTICAL ACTIVITY 3.1.1

#### Reversible and irreversible reactions

Suggested duration: 25 minutes  
Research and planning

#### AIM

To perform the following reactions and determine which are reversible and which involve open or closed systems. The reactions are:

- A formation of hydrated and dehydrated cobalt(II) chloride
- B reaction of iron(III) nitrate and potassium thiocyanate
- C burning magnesium
- D burning steel wool

#### RATIONALE

This practical activity will allow you to examine several reactions, some of which do not go through to completion. An open system is a system that exchanges matter and energy with the surroundings. A closed system only exchanges energy with the surroundings.

Some reactions only occur in one direction and are described as irreversible, while other reactions are reversible.

In this investigation you will perform reactions in open and closed systems and consider whether the reactions are reversible or irreversible.

#### SAFETY

Material used	Hazard	Control
cobalt chloride	skin irritant, eye irritant, respiratory tract irritant or burns	Wear gloves, laboratory coat and safety glasses
0.1 mol L <sup>-1</sup> Fe(NO <sub>3</sub> ) <sub>3</sub> solution	irritating to the eyes, respiratory tract and skin	Wear gloves, laboratory coat and safety glasses
0.1 mol L <sup>-1</sup> KSCN solution	irritating to eyes and skin	Wear gloves, laboratory coat and safety glasses
magnesium ribbon	burned produces intense white light, which can be harmful to eyes; could burn skin and clothing	Use tongs and eye protection; do not look directly into the flame.
iron	burned iron fragments very hot; could burn	Use tongs.

#### Part A—Formation of hydrated and dehydrated cobalt(II) chloride

#### METHOD

- Set up a Bunsen burner, tripod and gauze mat on a bench mat with a crucible on top.

## PRACTICAL ACTIVITIES

Practical activities take a highly scaffolded approach from beginning to completion and give students the opportunity to complete practical work related to the subject matter covered in the syllabus. Practical activities include a rich assortment of tasks that maximise the learning opportunities and build experience in skill application in relation to calculations and analysis of data, which are necessary for the data test. Every mandatory practical is featured, as well as many suggested practicals. Like the worksheets, a range of questions building from foundation to challenging are included, which are written to reflect the Marzano and Kendall taxonomy instructional verbs.

## TOPIC REVIEW QUESTIONS

Each topic concludes with a comprehensive set of question items consisting of multiple-choice and short-answer responses.

Topic reviews provide an experience of subject matter and skills across the breadth of the topic. They also incorporate the cognitive verbs used in the syllabus subject matter dot points. These items reflect the highest level of thinking that will be assessed on the external examination.

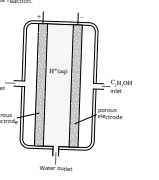
#### TOPIC REVIEW 4.2 • CHEMICAL SYNTHESIS AND DESIGN

**Multiple-choice questions**

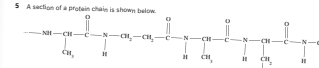
Questions 1 and 2 refer to the following information.

Polystyrene is one of the most widely used plastics. It is made from the monomer styrene, which in turn is synthesised from 4H)benzene by the reaction below. The reaction is endothermic.

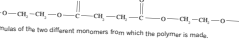
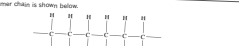
$$C_6H_5CH_2CH_3(g) \rightleftharpoons C_6H_5CH=CH_2(g) + H_2(g)$$

- Select which one of the following sets of reaction conditions would favour the highest rate of reaction in an industrial synthesis of styrene.
  - A 250°C; 1 bar pressure
  - B 250°C; 1 bar pressure
  - C 400°C; 2 bar pressure
  - D 400°C; 1 bar pressure
- Select which one of the following sets of reaction conditions would favour the highest equilibrium yield in an industrial synthesis of styrene.
  - A 250°C; 2 bar pressure
  - B 250°C; 1 bar pressure
  - C 400°C; 2 bar pressure
  - D 400°C; 1 bar pressure
- The figure below shows a fuel cell designed to use ethanol as a fuel using an acidic electrolyte. The cell reaction is:
 
$$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$$
 The cathodic reaction for the cell is:
 
$$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$$
 Select which one of the following is the correct anodic reaction.
 

#### TOPIC REVIEW 4.2 • CHEMICAL SYNTHESIS AND DESIGN

- A section of a protein chain is shown below.
 
 Identify the two amino acids that did not react to form this fraction of the chain.
  - A CH<sub>3</sub>COOH      B H<sub>2</sub>NCH<sub>2</sub>COOH
  - C CH<sub>3</sub>CH<sub>2</sub>COOH      D H<sub>2</sub>NCH(CH<sub>3</sub>)COOH
- Select the polymer below in which the monomer units are joined together by glycosidic bonds.
  - A cellulose
  - B protein
  - C polyester
  - D polypropene

**Short-answer questions**

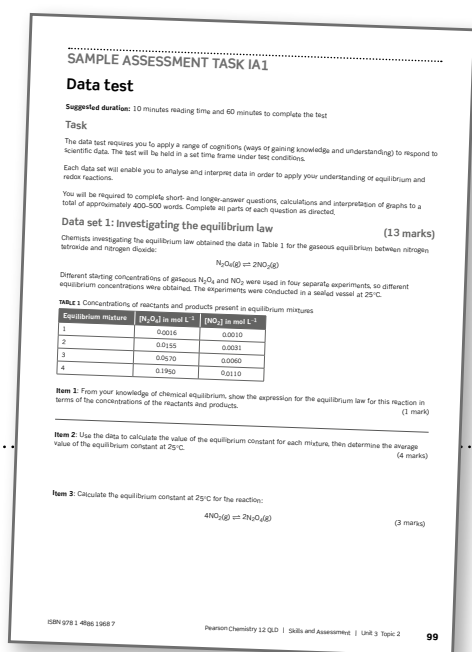
- Synthetic polymers can be manufactured to suit a wide range of different uses. They play a vital role in many applications, in fields as diverse as medicine, transport and housing.
  - A section of a polymer chain is shown below.
 
    - Show the formulae of the two different monomers from which the polymer is made.
    - Name the other compound that is produced when the two monomers react.
    - State the name given to the type of reaction that forms this polymer.
  - A section of a polymer chain is shown below.
 
    - Show the formulae of the monomer from which the polymer is made.
    - State the name given to the type of reaction that forms this polymer.

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## SAMPLE ASSESSMENT TASKS

Sample assessment tasks for the data test, student experiment and research investigation provide opportunities for students to practise responding to these assessment tasks. The activities are designed to support students by guiding and scaffolding them through each aspect of these assessments.



## ICONS AND FEATURES



Every mandatory practical is supported by a complementary SPARKlab alternative practical.

The *Pearson Chemistry 12 Queensland Skills and Assessment* book icons in the student book indicate the best time to engage with an activity from the skills and assessment book. These activities can be used for practice, application and revision of subject matter.

The type of activity is indicated by the following icons in the student book:

Worksheet (WS)



Practical activity (PA)



Mandatory practical (MP)



Topic review (TR)



Sample assessment task (SAT)



The **safety icon** highlights significant hazards, indicating caution is needed.



The **safety glasses icon** highlights that protective eyewear is to be worn during the practical activity.

## RATE MY LEARNING

This innovative feature appears at the end of most worksheets, and all practical activities and sample assessment tasks. It provides students with the opportunity for self-reflection and self-assessment. Students are encouraged to consider how they can continue to improve, and to identify areas of focus for further skill and subject matter development. This tool has been based on the Marzano and Kendall taxonomy.

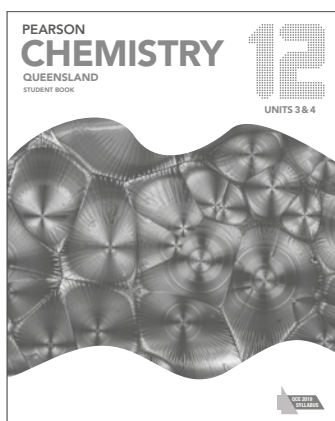
### RATE MY LEARNING

- |  |   |  |   |   |
|--|---|--|---|---|
| <ul style="list-style-type: none"> <li>I get it.</li> <li>I can apply/teach it.</li> </ul> | <ul style="list-style-type: none"> <li>I get it.</li> <li>I can show I get it.</li> </ul> | <ul style="list-style-type: none"> <li>I almost get it.</li> <li>I might need help.</li> </ul> | <ul style="list-style-type: none"> <li>I get some of it.</li> <li>I need help.</li> </ul> | <ul style="list-style-type: none"> <li>I don't get it.</li> <li>I need lots of help.</li> </ul> |
|--|---|--|---|---|

## Teacher support

Fully worked solutions, suggested answers and responses to the worksheets, practical activities, mandatory practicals, topic reviews and sample assessment tasks are provided for teachers through the Teacher Support subscription. Risk assessments, expected results and handy hints for all practical activities are also provided.

# Series overview



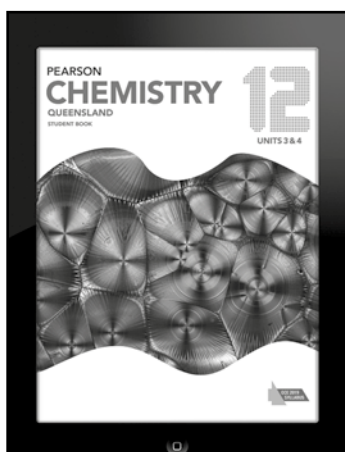
## Student book

*Pearson Chemistry 12 Queensland Student Book* has been developed by experienced Queensland teachers to address all the requirements of the new QCAA Chemistry 2019 General Senior Syllabus. The series features the very latest developments and applications of chemistry, literacy and instructional design to ensure the content and concepts are fully accessible to all students.



## Skills and assessment book

The *Pearson Chemistry 12 Queensland Skills and Assessment* book gives students the edge in preparing for all forms of assessment. Specifically prepared to provide opportunities to consolidate, develop and apply subject matter and science inquiry skills, this resource features a toolkit, key knowledge summaries, worksheets, practical activities and guidance, assessment practice and topic review question sets.



## Reader+ the next generation eBook

Reader+ is our next generation eBook. Students can read, take notes, save bookmarks and more in the one seamless experience. Integrated multimedia (audio/video) and interactive activities enhance and extend the learning experience. In addition, Reader+ provides the digital-only Chapter 1 Chemistry skills and assessment toolkit.

## Teacher support

*Pearson Chemistry 12 Queensland Teacher Support* provides:

- complete answers, fully worked solutions or suggested answers to all tasks in the student book, and the skills and assessment book
- expected results, common mistakes, suggested answers and full safety notes and risk assessments for all practical activities
- teaching, learning and assessment programs.



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