Chapter overview

In this chapter students describe the properties and uses of some common elements, including metals and non-metals, explain why internationally recognised symbols are used for elements, identify examples of common compounds, use the type and arrangement of particles to contrast elements, compounds and mixtures, and describe how new technologies have changed our understanding of elements. Students will also investigate how different cultures in the past have applied their knowledge of elements and compounds to their use in everyday life, propose reasons why society should support scientific research into the development of new materials, and describe how scientific knowledge and collaboration are used in making new substances.

Content identified as Additional in the New South Wales Syllabus includes asking students to discuss the cost and benefits to society of the development of new materials and investigate how the chemical properties of a substance will affect its use.

Pre-prep

Practical investigations involving chemical reactions and changes will help students grasp the concepts presented. The practical investigations will require chemical preparation, so check the requirements beforehand.

Students will learn the most from this chapter if practicals and demonstrations are used. A number of extra activities are included in the Learning strategies to suit students' interests. Use atom models for understanding elements and compounds.

This chapter should take about 3 to 4 weeks.

Pre-quiz

1 **Define** what the symbol Fe stands for.
It is the symbol for iron, from the Latin word ferrum.

2 **Identify** which symbol is used for fluorine: Fl, F, Fe, Fo, Fh.
F

3 **Explain** the difference between an element and a compound.
An element has only one type of atom. A compound has more than one type of atom.

4 State which element is the most important for sustaining life.
oxygen

6 Elements, compounds and mixtures

Have you ever wondered...

- why you can feel a breeze even though it's invisible?
- why diamond is the hardest natural substance on Earth?
- why water is written as H_2O?

After completing this chapter students should be able to:

- describe the properties and uses of some common elements, including metals and non-metals
- explain why symbols are used for elements
- identify examples of common compounds
- use the type and arrangement of particles to contrast elements, compounds and mixtures
- describe how new technologies have changed our understanding of elements
- investigate how different cultures have applied their knowledge of elements and compounds to their use in everyday life L IU A
- propose reasons why society should support scientific research into new materials such as pharmaceuticals and polymers EU CCT PSC S
- describe how science is used to produce new substances CCT

ADDITIONAL

- discuss the cost and benefits to society of the development of new materials
- investigate how the chemical properties of a substance affect its use.

What's coming up

By the end of the chapter, students will be able to explain and demonstrate elements, mixtures, compounds and atoms. Students will also explore specific substances, both elements and compounds, which have made an impact throughout history on human life.

Chemistry in Year 9 Science will build on this topic.

RESOURCES

Pearson eBook

Teacher support
A comprehensive mapping of *Pearson Science New South Wales 8* against the New South Wales syllabus and detailed teacher programs are available on Pearson eBook.

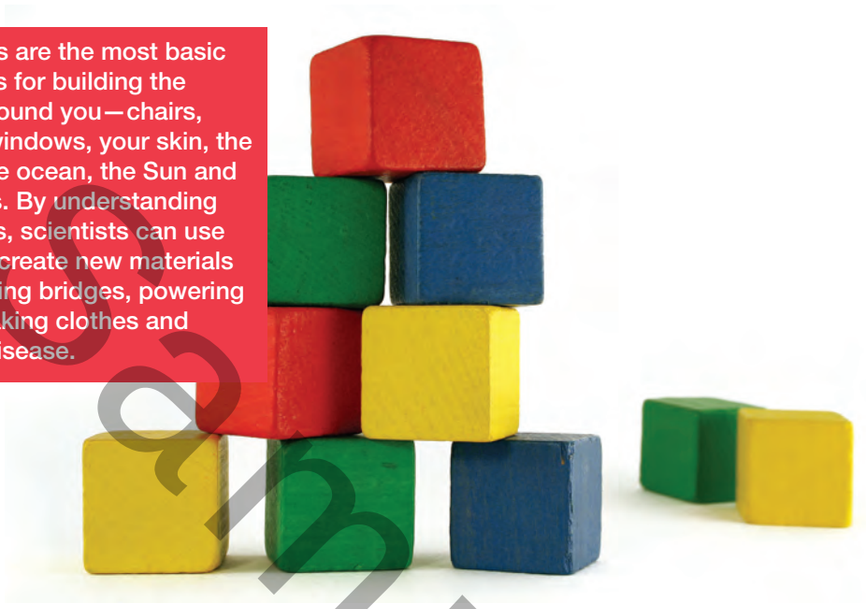
These documents can be edited and adapted to suit the needs of your students and the requirements of your school.

Chapter 6 safety notes and risk assessments
This single document contains safety notes and risk assessments for all Practical investigations in Chapter 6.

Weblinks
These websites support Chapter 6.

6.1 Elements

Elements are the most basic materials for building the world around you—chairs, desks, windows, your skin, the trees, the ocean, the Sun and the stars. By understanding elements, scientists can use them to create new materials for building bridges, powering cars, making clothes and curing disease.



Atomic Lego®

Every substance in the universe is made up of building blocks known as **atoms**. There are only about 100 types of atoms but they can be arranged in different combinations to create countless types of different substances. In this way, atoms are like tiny pieces of Lego. Imagine you just have red, blue and green blocks of Lego. With just these three types you can construct many different Lego combinations. Figure 6.1.1 shows just a few. In a similar way, the 100 or so different types of atoms can be used to create the millions of substances you see in the world around you.

Unlike blocks of Lego, atoms are round like tiny balls. They are so small that they cannot be seen with even the most powerful optical microscope. Instead, scientists must use a **scanning tunnelling microscope (STM)** to obtain images of atoms such as the copper atoms shown in Figure 6.1.2 on page 230.

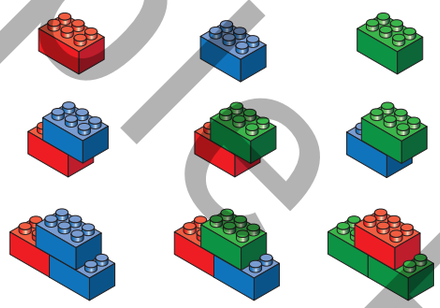


Figure 6.1.1 With just a few types of Lego, you can create many different combinations. Similarly, it takes just 100 or so different types of atoms to make up every substance in the universe.

6.1 Vocabulary preview

atoms
brittle
ductile
element
lattice
lustrous
malleable
metals
molecules
monatomic
non-metals
periodic table
properties
scanning tunnelling microscope (STM)

Learning strategies

Literacy strategy

Keep reading simple

MI: Verbal/Linguistic

L

The terms used in this unit are abstract and complex. As students read they should be challenged to write an explanation of each term listed in the Vocabulary preview in a simple way, so that they could explain it to one of their peers. Students should also make an A3 poster that lists each term with its definition and examples or illustrations.

Homework

Atomic Lego

MI: Visual/Spatial, Logical/Mathematical

CCT

Provide students with Lego or other types of building blocks and ask them to think about how these relate to atoms. What other toys do they have at home that could be described as building blocks? Have them take four different colours of blocks and see how many different combinations they can make.

Extension

Element research

MI: Verbal/Linguistic

ICT

Ask students to select an element and to research that element—when it was discovered, and what its properties and uses are. Research could be presented to the class.