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- Module 1: Carbon
- Level: Years 5 to 6
- INQuIRY: Investigate
- Lesson 3: Constructing carbon compounds
- Teacher notes

Investigate

Lesson 3
Teacher notes
Constructing carbon compounds

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INQuIRY

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Constructing carbon compounds

Lesson 3: Teacher notes

This document provides the teacher with the details of the lesson.

At a glance

To provide students with hands-on, shared experiences of **carbon** as a chemical as well as some of the different carbon-based chemicals that commonly exist.

To support students to represent and explain their understanding of carbon as a chemical and a component of other chemicals.

INQuIRY focus: **Investigate**

The *Investigate* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Investigate* phase ensures all students have a shared experience that can be discussed and explained.

In the *Investigate* phase students develop a literacy product to represent their developing understanding. They discuss and identify patterns and relationships within their observations. Students consider the current views of scientists and deepen their own understanding.

Assessment guide

This assessment guide supports teachers in identifying the types of assessment that are appropriate for this lesson.

Formative assessment is an important aspect of the *Investigate* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. It involves monitoring students' developing understanding of:

> carbon as a chemical and a component of other chemicals.

You will also monitor their developing science INQuIRY skills.

Summative assessment of the science inquiry skills is another important focus of the *Investigate* phase. Rubrics can be used to gauge the level of student achievement on performance tasks.

Key lesson objectives

Science

Students will be able to:

> observe carbon in its basic atomic structure
> construct models of basic carbon-based molecular structures, such as CO_2
> understand that carbon exists in many different forms on the Earth.

Literacy

Students will be able to:

> contribute to discussions about carbon's basic atomic and molecular structures

> record ideas, descriptions and explanations in diagrams and words.

This lesson also provides opportunities to monitor the development of students' general capabilities.

Teacher background information

Carbon is an element that forms many of the living and non-living structures on Earth. There are many other elements that make up these structures, including hydrogen and oxygen. Together, in an endless variety of combinations, all of the elements on Earth make up every single living and non-living thing on the planet.

Carbon can exist either in its elemental form (which varies depending on the arrangement of carbon atoms) or it can chemically combine with other elements to form carbon compounds. A compound is any chemical that is made up of two or more different chemical elements. When atoms chemically combine to form compounds, their attachment to one another is extremely strong and not easily undone. The chemical attachment between two atoms in a compound is also more commonly known as a chemical *bond*.

One of the most common carbon-based chemical compounds is carbon dioxide. Carbon dioxide is made up of a single carbon atom chemically combined with two oxygen atoms. Both of the oxygen atoms bond with carbon and not with each other.

Other examples of common carbon-based compounds include sugars in the food we eat, plastics that we use every day, carbon monoxide from the exhaust of cars, petroleum products such as methane, petrol for the car and the list goes on.

The entire body of any living thing, such as a human or the tallest tree, is mostly made of carbon, combining with many other different elements. For this reason, scientists sometimes call living things 'carbon-based life forms'.

Non-living things, such as rocks, and dead things, such as decaying plants and fossils, are also mostly made up of carbon.

Equipment

For each Student

> A molecular construction kit* or, if unavailable, toothpicks and suitable soft spherical-like objects, such as marshmallows.

> Students will each require a copy of the *Constructing carbon compounds Student worksheet*.

*Molecular construction kits are widely available from companies that specialise in educational science equipment and materials, are relatively inexpensive and can be easily sourced on the internet.

Preparation

> For the *Constructing carbon compounds* activity:
  – Read through the *Student worksheet*.
  – Familiarise yourself with the carbon compounds requiring construction.
  – Prepare all the equipment.
  – *Optional:* Organise a camera to take photographs of the students' constructed carbon compounds.

Lesson steps

1. Facilitate a class discussion about carbon and carbon compounds. Some prompt questions can include:
> Describe what carbon is in a *scientific* way.
> Draw what carbon looks like to you.
> Where can you find carbon on the Earth? What forms does it normally take?
> What is the difference between pure carbon and the carbon in carbon dioxide?
> What is carbon dioxide? What is it made of? How does it form?
> Draw what carbon dioxide looks like to you.
> How do atoms (or chemicals) in a compound remain attached to each other?
> Describe what a carbon compound is in a *scientific* way.
> Draw an example of a carbon compound.
> What other examples of carbon compounds do you know?
2. Come to a class consensus (with your guidance and input) about the definition of an element and a compound, and the function of a chemical bond.
3. Explain to students that they are about to make some carbon compounds. Hand out the *Constructing carbon compounds Student worksheet*. Introduce both the 'ball' component of the construction kit (i.e. the modelling clay) as an element and the 'stick' component of the construction kit (i.e. the toothpick) as a chemical bond.
4. Students to construct the three models on the worksheet, and draw and label them.
Note: The third model – glucose – is a challenging one and should be used as an extension task for some students only.
5. If possible, take photographs of the students' models.