Science 7–10 (2023): Data Book guide

The Science 7–10 Data Book is designed to support the implementation of the *Science 7–10 Syllabus*. It is intended to shift the emphasis from recall of factual materials to nurturing a deeper understanding and application of scientific concepts. This shift aligns with modern teaching methodologies, focusing on critical thinking and analytical reasoning skills.

Teachers are provided with the flexibility to adapt the use of the Science 7–10 Data Book according to context and teaching need. They may choose to distribute the whole document to students to use in class and/or for assessments, or to provide extracts relevant to specific focus area(s) to reduce the cognitive load required to navigate the larger document.

Students have diverse interests, needs, abilities, backgrounds and learning preferences. The flexibility of how and when to use the Data Book will allow teachers to meet the specific requirements of their students.

Benefits for students

The Science 7–10 Data Book can be used to complement students' learning in many ways. These can include:

- Reducing the burden of memorisation. Students can focus on applying the scientific knowledge and capabilities needed to engage as scientifically literate citizens, rather than relying on the memorisation of factual information
- Encouraging a focus on application. This enables students to concentrate on applying the data from the Science 7–10 Data Book effectively and without the need for recall.
- Encouraging students to differentiate between recalling and actively applying information. For example, students are not expected to memorise the first 18 elements of the periodic table in order. They could use the periodic table in the Data Book to consider the arrangement of the elements and how the structure of the periodic table provides valuable information about the elements, including their chemical properties, atomic structure and trends.
- Preparing for Stage 6 Science courses. The Science 7–10 Data Book helps those students continuing to study science courses into Stage 6 learn how and when to access the information provided. This offers an opportunity to practise using this type of resource earlier in their scientific studies. For example, the effective use of data sheets is an essential skill in Stage 6 Science courses.
- Developing data literacy. It is important that students understand the significance of having access to quality resources. By observing teachers consistently model the use (or application) of information such as that in the Science 7–10 Data Book, students have the opportunity to acquire the skills needed to discern when and how to access relevant data.

Practical examples

Example 1

In the Stage 4 focus area, Forces, students describe the relationship between weight, force, mass and acceleration (gravity) and perform calculations using $F = mg$.

Teachers could ask students to use the Science 7–10 Data Book to find this equation. Teachers could enrich the learning and ask students to:

- discuss the significance of Earth's gravity for life on Earth
- consider how the weight of an object changes depending on the local gravity, for example by comparing Earth to other planets or astronomical objects
- calculate the gravity on other astronomical objects when given weight and mass data.

Example 2

In the Stage 5 focus area, Reactions, students may perform a practical investigation into solubility.

Teachers could ask students to:

- confirm some of the solubility data provided in the Science 7–10 Data Book
- use the solubility data to identify an unknown solution based on its precipitation reactions
- create their own solubility data table based on precipitation reactions and/or direct tests of solubility.

Example 3

In the Stage 4 focus area, Solutions and Mixtures, students are required to 'conduct a practical investigation and select appropriate equipment to measure the density of water and other substances, and record the results in a table to compare the calculated density with SI data'.

Students could use the following experiment to measure the mass and volume of a range of metals, use that data to calculate their density, and then compare it with the values given in the Science 7–10 Data Book.

Aim

To measure and compare the densities of aluminium, silver, copper, gold and magnesium.

Apparatus

- Samples of aluminium, silver, copper, gold and magnesium (small pieces or strips)
- A digital balance (accurate to at least 0.01 grams)
- A measuring cylinder (50 or 100 mL)
- Water
- Calculator
- Safety goggles

Method

1. **Safety first** Put on your safety goggles to protect your eyes.

2. **Prepare the measuring cylinder**

    a) Fill a graduated cylinder with water to a level that allows you to fully immerse the metal samples without causing the water to overflow when the samples are added.

    b) Record the initial water level (Volume A) in the graduated cylinder.

3. **Measure and record the mass**

    a) Use the digital balance to measure the mass (m) of each metal sample separately. Record the mass in grams.

    b) Record the mass in grams (g) for each metal.

4. **Calculate the volume of each metal**

    a) Carefully place one sample of aluminium into the graduated cylinder, making sure it is fully submerged.

    b) Record the new water level (Volume B) in the graduated cylinder.

    c) Calculate the volume of the metal by subtracting Volume A from Volume B ($Volume\ V\ = Volume\ B\ -\ Volume\ A$). The volume should be in millilitres (mL).

5. **Calculate the density**

    a) Use the formula: $\rho = \frac{m}{v}$

    b) Calculate the density for each metal using the respective mass and volume data you recorded.

6. **Repeat for each metal**

    a) Repeat steps 3 to 5 for all the other metal samples (silver, copper, gold and magnesium).

7. **Record and compare**

    a) Record the calculated densities for each metal in a table.

    b) Compare the densities of the different metals with the densities listed in the Science 7–10 Data Book.