

Improve your memory

For science students

Science students often need to memorise complex and detailed information. This pamphlet provides some strategies to help you remember scientific material more effectively. You can experiment with different techniques yourself and develop methods that suit your own learning style and the subject matter.

Generally speaking, the more important it is for you to remember something, the more actively you need to engage with it and the more frequently you need to revisit it.

To memorise something you need to attend to it, to store it and be able to retrieve it.

Here is a method to help you remember things:

- Why?** Establish the benefit of recalling this knowledge (after all, we can't memorise everything)
- How?** Determine how your brain best stores and retrieves information
- What?** Categorise and relate to the information (*make* it memorable)
- When?** Actively review and revise the material frequently

1. Establish why you need to remember something

Memorising detailed material is a different process to *learning* theory or concepts; hence the methods you use to store these types of information are different. The first step in memorising something is to be motivated to remember it. Ask yourself **why** you need to commit it to memory. Is it fundamental knowledge in your subject area? For example, the structure of molecules is fundamental in organic chemistry and knowledge of electric circuits is fundamental in physics. Sometimes you need to remember an author's name and experiments so that you can refer to them in an exam or a tutorial. You will remember things better if they are important to you.



2. Focus your attention on the information

Your brain 'files' information in a more accessible way if you pay attention to the information carefully in the first place. When you first attempt to memorise new material, it is important to:

- choose a time when you feel alert
- work in a place with minimal distractions
- focus your full attention on it
- use your preferred learning style

You can get an idea of your preferred learning style by taking a test at: <http://www.engr.ncsu.edu/learningstyles/ilsweb.html>.

The table below gives you some examples of how different learners might prefer to remember things:

Visual (~55% of the population)	Auditory (~30% of the population.)	Kinaesthetic (~5% of the population.)
WRITE lists	READ lists aloud	TRAVEL lists (in your head, move through a familiar space (e.g. your bedroom) associating familiar objects with the items on your list)
Use pictures, VISUALISE information as 3D images	Associate with sounds rather than words	
Use concept maps and timelines	EXPLAIN diagrams to yourself	Write the information on place cards and MOVE them around as you memorise them (lay them out in a design that helps you connect them, omit some and see if you can recall the 'gaps' from memory etc.)
DRAW diagrams/flow charts	Use auditory cues (e.g. tell yourself ' <u>listen</u> , I have to remember this..')	

Information will be retrieved via the same process that you used to store it. Hence if you're not sure which method of storing information is best for you, think about how you would like to retrieve the information - do you want text to trigger the memory (i.e. reading an exam question?) or sounds (do you read the questions 'aloud' in your head?) or via connections to other things? Match your techniques to your preferred outcomes.

3. Consolidating the information to be remembered

A mass of new information can seem overwhelming - how can you consolidate the numerous pieces into something more manageable? You need to bring the material together (group it) and relate it to things that you already remember easily, or things that mean something to you. You need to *make it memorable!*

Grouping the information

Research into memory suggests that most of us can only hold seven, plus or minus two, items of new information in our short-term memory at once. You can 'chunk' information, by remembering a group of items as one unit and so increase the amount of information you can remember. You do this, for instance, when you recall the

differences between mammals and reptiles, or their similarities - as opposed to a tree! Obviously, the grouping of information can help us to recall and categorize far more complex material than this, so utilise this technique whenever you are faced with a mass of new information. For example, you could divide the chemical properties of compounds into their functional groups.

Connect new material with your existing knowledge

Draw a concept map of your existing knowledge of a topic and show how the new material fits into the map

Link new material with things, places or people that you can already recall easily. The best 'memory triggers' are the ones that are specific to you.

Use new material in a meaningful context

Relate new concepts to 'the real world' For instance, if you encounter the word, 'hypothyroidism' you may remember it better if you consider - what would it mean to your life if you had it? What symptoms? What effects? You can also consider language roots as contrasts – hyperthyroidism - what effects would that cause? (Hypochondriac may then become applicable...). Words in a text can become more meaningful if you consider their 'real world' implications, making them easier to remember.

Use a new formula to solve a variety of different problems.

Explain a biochemical cycle to a friend. Teaching others requires your brain to order and reproduce information logically and this process helps you to consolidate your own understanding of the material.

Mnemonics

Use memory tools, called 'mnemonics'. Although they are generally meaningless (ROYGBIV for the spectrum of visible light), mnemonics may be so vivid that you remember them for your lifetime. The most memorable mnemonics are the ones you create for yourself (the sillier the better). Remember, the idea is to *make it memorable*, and where the information itself is not particularly easy to remember, a silly mnemonic can certainly help. Some examples of mnemonics are shown on page 4 of this handout.

4. Actively review and revise the material frequently

One of the ways in which memorising detailed material is different to learning theory is the need to re-visit it over and over again in a short space of time during the initial learning phase. The amount of repetition and the time between reviews will depend on your brain and the complexity of the material to be remembered, so evaluate these for yourself.

Review frequently: A guide is to review after 24hrs, again after another 24hrs, then after 48hrs and again after a week.

Test yourself: Test yourself on the new information frequently and correct your mistakes.

This will help to fix the information in your long-term memory and facilitate recall when you need it, alleviating the pressure on your short-term memory.

Mnemonic	Example
Link the first letters of the materials to be remembered to the first letters of words in a crazy sentence.	To remember the nine essential amino acids for humans: isoleucine, leucine, lysine, threonine, valine, tryptophan, histidine, methionine, phenylalanine, some students remember the sentence: "I love lysine though Val thinks his meth's preferable." (Verhagen 2004)
Use acronyms to help remember the order of words.	LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. You can invent your own acronyms for word sequences you need to remember. ELMO (for Sesame St fans) reminds us that Electron Loss Means Oxidation.
Create a rhyme that includes the concepts to be remembered	Sedges have edges Rushes are round Grasses are hollow, right down to the ground. (Verhagen 2004)
Set the words to be remembered to a memorable song	Students have used the nursery rhyme, Twinkle Twinkle Little Star, to memorise quadratic equations and the Christmas carol, the Twelve days of Christmas to remember the twelve pairs of cranial nerves.
Create memorable visual images	Melanie had difficulty in remembering the composition of chemical compounds but she had no difficulty in remembering the names of her friends. To remember the make-up of compounds she associated each commonly found cation, such as sodium (Na^+), lead (Pb^{++}) and aluminium (Al^{+++}), with the name of one of her male friends. Then she associated each anion, such as chloride (Cl^-) or oxide (O^{--}) with one of her female friends. After that, the formation of compounds became a fun exercise of grouping her friends together in different combinations with different interesting outcomes (properties)!
Locate things to be remembered at different points along a journey.	For example, to remember a sequence of chemical reactions, imagine each reaction in the correct order occurring at a different spot along your route from home to university. To recall the sequence of reactions, imagine walking to university and finding the correct reaction at each spot. You can revise this every day!
Visualise the things to be remembered as a picture or a story.	For example, you could picture the shapes of organic compounds as innovative house designs with each oxygen atom O, as a bathroom and the bonds as passageways connecting bedrooms, methyl groups (CH_3) to lounge rooms (N).

References

Sargeant, D. & Clinkenstein, A. (1998). *Remembering Well: How memory works and what to do when it doesn't*. St Leonards, NSW. Allen and Unwin,

Verhagen, J. 2004 Science jokes: Section 11-Mnemonics.
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