

Chemistry

An Introduction for
Medical and Health Sciences

Alan Jones

*Formerly Head of Chemistry and Physics
Nottingham Trent University*



John Wiley & Sons, Ltd

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Preface

Recent years have seen significant changes in the practice, education and training of doctors, medical, nursing and healthcare professionals. Pieces of paper are required to show competency in a wide range of skills. There is also a requirement for continuing professional development in order that people increase their knowledge and skills. The United Kingdom Central Council for Nursing, Midwifery and Health Visiting publication *Fitness for Practice* notes that there will be: 'greater demands upon nurses and midwives for technical competence and scientific rationality'.

The daily use of chemicals in the form of medicines and drugs means that there is a need for a basic understanding of chemistry. Do not be put off by this, as you will not be expected to be a chemical expert, but you will need to have some knowledge of the various chemicals in common medical use. You will not be expected to write complicated formulae or remember the structures of the drugs you administer, but it will be of use to know some of their parameters. Modern healthcare is becoming increasingly scientific, so there is a necessity to have a good introduction to chemical concepts. Scientific and chemical understanding leads to better informed doctors, nurses and healthcare workers.

This book starts each chapter with a self-test to check on chemical understanding, and then proceeds to move through the subject matter, always within the context of current practice. Anyone able to pass well on the self-test can move onto the next chapter. I hope you will find the Glossary a useful reference source for a number of chemical terms.

Finally, I would like to thank Mike Clemmet for his valuable contributions to earlier versions of the book, also Dr Sheelagh Campbell of the University of Portsmouth who reviewed the draft manuscript, and Malcolm Lawson-Paul for drawing the cartoons. Perhaps he has learned a little more about chemistry along the way!

Alan Jones

Introduction

This book is intended to introduce some of the basic chemistry for the medical and healthcare professions. The material is suitable for any such course or as a refresher for people returning to the profession. It is designed to give a basic introduction to chemical terms and concepts and will develop the relevant chemistry of drugs and medicines in common use in later chapters.

It can be used as a self-teaching book since it contains diagnostic questions at the beginning of each chapter together with the answers, at the end of the chapter.

It can also be used to supplement the chemistry done on any suitable course. It is not a compendium or list of current drugs and their contents. It is also suitable for people who have a limited chemical knowledge as it starts with the basic concepts at the start of each chapter.

How to use the book

Read Chapter 1. Just read it through quickly. Do not worry about total understanding at this stage. Use it as an introduction or refresher course for chemical terminology

Take in the ‘feeling’ of chemistry’ – and begin to understand the basic principles. Think, but do not stop to follow up any cross-references yet. Just read it through. That will take about twenty minutes.

When you’ve read this section through once, and thought about it, read it through again, a few days later, but this time take it more slowly. If you are unclear about the chemical words used in Chapter 1 and the others Chapters, use the Glossary at the end of the book for clarification. After reading the whole of Chapter 1 you will be ready for a more detailed study of the relevant areas of chemistry in later chapters.

At the start of each chapter there are some diagnostic questions. If you get more than 80 % of the questions right (the answers are given at the end of each chapter),

you probably understand the principles. Be honest with yourself. If you really feel that you do not understand it, talk to someone. Start with a fellow student. Then, if the two of you cannot sort it out, ask your lecturer/tutor – that is what they get paid for! You can always read the chapter again a little later. Sometimes familiarity with the words and concepts from a previous reading helps when you read it a second time. Remember this is a study book for your own professional development not a novel where it does not matter if you cannot remember the characters' names.

It will also be helpful, whenever needed or as an aid to your memory, to check on things by looking up words, concepts and definitions in the Glossary. Keep a notebook handy to jot down useful items to remember later.

Throughout the book, as you would expect, there are formulae and structures of chemical compounds. You need not remember these but they are included to show the principles being covered. You are not expected to work out the names of these compounds or balance equations but after a while some might stick in your memory.

In each of the later chapters there are 'scene setters' for the concepts covered in the chapters. The chapters start up with basic ideas and lead onto more detailed chemistry and applications.

Anyway, here we go! Enjoy it! I did when I wrote it and even later when I re-read it. Excuse my sense of humour; I feel it is needed when studying chemistry.

1 Starting Chemistry

Learning objectives

- To introduce some of the most relevant and commonly used chemical concepts, processes and naming systems.
- To show some of the background upon which medicinal chemistry is based.

Diagnostic test

Try this short test. If you score more than 80 % you can use the chapter as a revision of your knowledge. If you score less than 80 % you probably need to work through the text and test yourself again at the end using the same test. If you still score less than 80 % then come back to the chapter after a few days and read it again.

1. What is the main natural source of drug material for research? (1)
2. What charge has each of the following particles: proton, neutron, electron? (3)
3. Covalent bonding gains its stability by what process? (1)
4. Ionic bonding gains its stability by what process? (1)