

**AN INTRODUCTION
TO THE STUDY OF
CHEMISTRY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649426720

An Introduction to the Study of Chemistry by A. P. Luff

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

A. P. LUFF

**AN INTRODUCTION
TO THE STUDY OF
CHEMISTRY**

AN INTRODUCTION
TO THE
STUDY OF CHEMISTRY

*SPECIALLY DESIGNED FOR MEDICAL AND
PHARMACEUTICAL STUDENTS*

BY

A. P. LUFF, F.I.C., F.C.S., F.L.S.

FELLOW OF THE BERLIN CHEMICAL SOCIETY; MEMBER OF THE PHARMACEUTICAL SOCIETY
OF GREAT BRITAIN; FORMERLY DEMONSTRATOR OF CHEMISTRY IN ST. MARY'S
HOSPITAL; LECTURER ON CHEMISTRY IN THE CENTRAL SCHOOL OF
CHEMISTRY AND PHARMACY.



LONDON
J. & A. CHURCHILL, NEW BURLINGTON STREET
1880

193. f. 75.

11

12

13

14

15
16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

P R E F A C E .

THIS small book has been written for the use of students commencing the study of chemistry. The endeavour of the author is to systematically introduce beginners to the study of the science, and to explain and render clear the elementary facts and laws connected with the subject. A special feature in the work is the space devoted to the construction of chemical formulæ, and the representation of reactions by means of chemical equations, portions of the subject which generally offer such serious impediments to the progress of the young student.

It is barely necessary to state, considering the small size of the book, that it is not a manual, nor even a manualette, of chemistry ; nor is it in any way concerned with the history of the elements and their compounds. The book is intended for study previous to working at a manual of chemistry, and the author trusts that the explanations of the elementary principles of the science, the exposition of its laws, the

modus operandi in the construction of chemical formulæ at will, and the writing out of equations, will remove many difficulties from the path of the young student, and prevent the feeling of helplessness and despair so often experienced on first opening a large text-book of chemistry.

It may be mentioned here that the matter contained in the last twelve pages will be found more especially useful to students when they have made some progress in the study, both theoretical and practical, of chemistry.

A. P. L.

London, February, 1880.

INTRODUCTION

TO THE

STUDY OF CHEMISTRY.

MATTER.

IN order to commence the Study of Chemistry clearly and definitely, it is absolutely necessary that the student should understand what matter is, the different forms in which it exists, and the laws which cause the existence of these different forms of matter.

The Three Forms of Matter.—Matter is that which is evident to the senses, and it exists in three forms, viz., the *solid*, *liquid*, and *gaseous*: any one of these forms of matter can be converted into either of the other two: thus by melting *solid* ice it becomes *liquid* water, and by boiling the liquid water *gaseous* steam is produced. The particles of all bodies are under the influences of two forces, an attractive force and a repulsive force; and according to the distribution of these forces of attraction and repulsion the different forms of

2 INTRODUCTION TO THE STUDY OF CHEMISTRY.

matter result (it will be shortly seen that the repulsive force, which the particles of matter have for one another, is identical with heat).

If one of the forces is in excess of the other, one of the two extreme forms of matter (the solid or the gaseous) results; if the two forces are equally balanced, the intermediate form of matter (the liquid) is the result.

Thus in all **solids** the force of attraction of the particles for one another is greater than the force of repulsion. The peculiarity of the solid form of matter is that the relative positions of its particles cannot be changed without the expenditure of more or less force; solids therefore tend to retain whatever form they may happen to possess.

In **liquids** the attractive and repulsive forces of the particles are equally balanced. The distinctive peculiarity of the liquid state is that the particles readily glide over one another and assume the shape of the vessel containing the liquid.

In **gases** the repulsive force of the particles is greater than the attractive force. The distinctive character of the gaseous state is that the particles are continually undergoing a struggle to occupy a larger space. It will now be easy for the student to understand why a gas can be compressed by additional pressure, and expanded by partial removal of pressure; the compression of a gas being brought about by the mechanical force employed overcoming the repulsive force of its particles: and the expansion of a gas being caused by the repulsive force of the

particles for one another coming into play when the pressure is removed.

It must not be supposed that the particles of any one of these forms of matter are in absolute contact with one another, although such is a common opinion with regard to solids and liquids. That solids are in reality porous, that the particles are not absolutely close together, is proved by hammering or powerfully pressing them, when they will be found to occupy a smaller bulk than they did previous to their being submitted to pressure: and again is shown by what is technically called the "sweating" of iron in the Bramah hydraulic press, where water under powerful pressure actually forces its way through the pores of a stout iron cylinder, although to the eye the iron appears perfectly compact and homogeneous. That liquids are porous is best proved by mixing certain liquids together, when a contraction in bulk takes place. If spirit and water be mixed together, a diminution in volume occurs, the particles getting closer together than they formerly were, due to a molecular combination of the spirit with the water; thus, in making the Proof Spirit of the British Pharmacopoeia, 100 fluid ounces of rectified spirit are mixed with 60 fluid ounces of water, producing only 156 fluid ounces of proof spirit: a contraction of about $2\frac{1}{2}$ per cent. having taken place.

The student having now become acquainted with the different forms of matter, the next thing for him to understand is how and under what conditions any one form of matter is capable of being converted