

Chapter 1: The Study of Matter

Julia Curmi

1 Introduction

Chemistry can be most simply and broadly described as the *study of matter*, hence the title of this chapter. While studying chemistry you will mostly be looking into properties such as structure and composition of the aforementioned **matter**, and **energy**. Although it is how these two interact together to form simple or complex reactions that is most fascinating.

A Reaction: When a substance is combined with another substance (*reactants*) under controlled conditions to produce one or more substances (*products*).

As a subject Chemistry merely attempts to organise and simplify the study of matter by classifying it in a number of ways. Matter is anything that takes up space within our universe, it is the air we breathe, the tea we drink and the notes you are currently holding in your hand or reading on your device. The simplest form of classification is done by dividing it into the three states of matter: **solid**, **liquid** and **gas**.

Reactions occur at every moment and all of us have in various occasions observed chemistry without being aware of it. The human body for example is a powerhouse for chemical reactions, most of what goes on in our body is in some way related to chemistry. In fact, Trillions of chemical reactions happen simultaneously in our body every single second, allowing us to function the way we do.

The old-man scientist in a lab coat mixing crazy looking chemicals and creating explosive reactions is typically what comes to mind when we think about scientists – this is not as accurate as popularity deems it to be. Contrary to popular belief, most Chemists tend to avoid explosions and most colourful liquids since they often come with hazardous properties.

Roman, Egyptian and Geek artists were able to get their hands on the brightest of pigments providing a common and distinctive feature in Ancient Art. These pigments were some of the deadliest poisons known to man till this day including Mercury, green arsenic, Naples yellow and white lead. The latter being used throughout the classical period even as a main ingredient in cosmetics. An-

cient Egyptians seems to have better luck with selection of chemicals for their cosmetics. Queen Cleopatra's heavy black lead infused eye make-up is in-fact believed to have protected her eyes from infectious diseases and even flies.

With this being said, one should always keep in mind - especially in practical settings that as beautiful as chemistry may be, it can also have very nasty consequences when dealt with in negligence.

The real beauty of chemistry shines through when one understands its intricacies and is able to make connections between different phenomena.

1.1 Understanding of Matter through the Ages

Throughout history people of intellect have focused their concern toward the determination of the 'Ultimate Composition of Matter'. Greek philosopher Aristotle was one who was known to have thought of matter as a combined composition of the four elements: earth, fire, water and air. Each of these elements demonstrated two of the four fundamental properties: moistness, dryness, coldness, and hotness. Aristotle claimed that with alterations to these basic properties, elements could be transformed or transmuted into one another. The idea of chemical elements was only introduced during the last two hundred years.

Furthermore, the determination that elements are composed of what we now call electrons, protons and neutrons was only introduced in the past hundred years, so it is a fairly modern idea, but one which has rapidly changed the world of chemistry. To this day, we have the knowledge of 91 naturally occurring elements which can be found systematically arranged in the periodic table of elements.