

Research Methodology in Chemistry

Edited by
Fiona N.-F. How, Ph.D



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RESEARCH METHODOLOGY IN CHEMISTRY

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CHAPTER – 2

DESIGN AND METHODOLOGY

Shafida Binti Abd Hamid

As explained in the previous chapter, the approach to chemical synthetic research which can be started by studying the current issues pertaining your topics of interest *via* literature review, followed by developing a hypothesis of your research area. Once the research topic has been decided, the theory, hypothesis and research problems need to be analysed in order to identify the type of data needed to support your hypothesis. The research design and methodology need to be chosen carefully because poor design experiment can affect the reliability of your results. Failure of reproducing the results describes a flaw in your experimental design and may force you to re-think and re-do the whole experiment.

In practice, before you start any experiment, you have to prepare your materials and make sure that the equipments needed are in good condition. Once the experiment has started, all the observations and data need to be recorded accurately and precisely. It is important to keep in mind that all data must be treated the same way, even the ones that do not support your hypothesis. This is to avoid manipulation of data. Once the data are analysed, you can draw the conclusion and check whether they support your hypothesis. If they do not, then find other possible explanation to the unexpected results (Russey et al., 2006).

Synthetic chemistry deals with the construction of specific molecules, which normally involves the development of synthetic methods and often employing the use of spectroscopy techniques to solve synthetic problems. The target molecules ranges from novel structures that display certain unique properties or intermediates in particular synthetic pathway. Therefore, research design in this area can also include the development of suitable and innovative reagents and/or catalysts for specific chemical transformations. In a nutshell, research in these areas should bring about fundamental knowledge for the development of chemical synthesis.

This chapter will focus more on organic synthesis. Organic synthesis covers two main areas of research. The first area is total synthesis, which deals with the construction of molecules from simple precursor obtained whether commercially or in nature. The second area is methodology, involving discovery, optimisation and study of scope and limitation of organic synthesis. Both areas are actually inter-related with each other. For example, in a search for total synthesis, chemists may discover a new methodology for certain types of reaction.