Introduction

One of the early proponents of students learning chemistry heuristically was Harold Armstrong who taught at Christ's Hospital School, in the UK in the early 1900s. (See blog on Threat to the heuristic method)

On page 22 of the current chemistry guide it quite clearly states that the content of the Nature of Science sections are a legitimate item for assessment. No more than about 2 to 3% of the final marks awarded in the written assessment (which counts for 80% of the total final mark) will be assessing the Nature of Science. However, if you look at the actual papers that have appeared since May 2016 you will see that in reality there is very little testing of the Nature of Science.

What I have found interesting is that when I was writing examination papers many of the other paper setters found it hard to write good Nature of Science questions (even though some of them are very experienced chemistry teachers and workshop leaders). The problem is that a good Nature of Science question really requires a genuine discussion for an answer and there are not the marks available to address this.

Similarly for ease of online marking the answers need to be fairly unambiguous whereas often there may be several very valid and often contradictory answers to a good Nature of Science question. What this means is that there have not yet been any whole questions just on the Nature of Science and there are unlikely to be any in the future. Nature of Science is examined as a small part (or parts) of a much bigger question on one or more of the mainstream topics. Although Nature of Science questions could also appear in one of the options questions in Section B of paper 3 this has not so far happened and is very unlikely in the future as there needs to be parity in the types of questions asked across all four options. Time will tell but, as is already happening, I suspect there are several types of Nature of Science questions which will tend to repeat themselves as clearly much of the Nature of Science is not easily assessable using the format that our written examinations currently follow.

Types of questions

When I analyse the examination papers that have so far been set on the current programme I am disappointed with the quality (and quantity) of the questions on the Nature of Science. In reality there have been very few Nature of Science questions. One on a Paper 2 exam asking students to "explore how earlier definitions of oxidation and reduction may have led to conflicting answers for the conversion of P_4 to $H_2PO_2^-$ and the way in which the use of oxidation numbers has resolved this was almost a repeat of one of the questions on a previous paper. Other questions which might loosely be termed Nature of Science such as "Suggest one advantage of using a computer generated molecular model compared to a ball and stick 3-D model" and "Outline why pH is more widely used than $[H^+]$ for measuring relative acidity" are almost referring directly to the 'Understandings' and 'Applications and skills' parts of the syllabus rather than to Nature of Science specifically.

The individual examples linked to this page all reflect particular areas of the Nature of Science which will be described in the introduction to the particular example. The intention is to give you some practice of the types of questions they may crop up. This should at least help you to understand that you have to think in a certain way if you want to excel in this area. Perhaps one of the best skills you can develop is to look critically at the information and data you receive and learn to question its validity, particularly any underlying assumptions that have been made.

Questions for practice

NoS question - Example 1

NoS question - Example 2