

2000 HSC Notes from the Examination Centre Science 3/4 Unit

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Science 3/4 Unit

Introduction

In 2000, 85 candidates presented for the 3 Unit paper and 239 candidates for the 4 Unit paper making a total of 324.

The majority of candidates gave responses throughout the papers that were of high calibre. Candidates indicated an extensive knowledge of the course content and a familiarity with good practical skills. The questions requiring interpretation of data and graph drawing were particularly well done by the majority of candidates.

The 3 Unit and 4 Unit candidates sit a common Core paper. Of the questions on the Electives paper, 3 Unit candidates must attempt any two questions while 4 Unit candidates must attempt four questions selected from at least three of the five areas.

In both core and electives, candidates are required to draw data from the data sheet supplied yet a significant number of candidates did not use the values given. Also, candidates were required to be familiar with the correct units that apply to various quantities. In general units were very poorly used by a majority of candidates.

In addition, for questions involving mathematical calculations, a significant proportion of candidates did not show their transcription of information from the question, and state the formula being used (if applicable). In some cases this resulted in incorrect data being used in the calculations. All working needed to be clearly shown, together with statements explaining relevant reasoning. Responses involving vector quantities should have included both magnitude and direction. Chemical equations needed states where appropriate. Diagrams needed to be clear, neatly and carefully drawn, in pencil, and be well labelled. Diagrams of scientific equipment needed to be drawn in such a way that the procedure being illustrated would work and the relative size of each piece of equipment was reflected in the diagram. Whenever diagrams were used they needed to be large enough to show all relevant details clearly.

Many candidates did not correctly use and convert units. Many candidates gave responses that were not related to the question asked.

In those cases where a question required an extended response, many candidates had difficulty in expressing their ideas concisely. The best responses addressed the question as asked precisely, with ideas presented in a logical order and with good use of scientific terms. Far too many candidates demonstrated a poor understanding of many scientific terms. Many responses to this type of question demonstrated difficulties in manipulating the written word to express their ideas.

While the core and elective parts of the course were examined in separate papers, the following comments apply to candidate's responses across both papers and are grouped on the basis of chemistry, physics, biology and geology.

While the majority of candidates demonstrated a good understanding of the chemistry being examined, the areas of weakness included the following.

- A lack of knowledge of the formulae and uses of common carbon compounds.
- When required to make a comparison, candidates did not discuss all cases listed and did not compare them.
- A lack of understanding of the distinction between **intermolecular** and **intramolecular** forces.
- An inability to relate the properties of matter, particularly gases and liquids, to the nature of the forces between the particles.
- A lack of understanding of the formation of ions by the gain or loss of electrons
- A tendency to use the terms “atom” or “molecule” in place of “ion” when referring to ionic substances such as sodium chloride.
- While candidates could state that hydrogen bonding occurs in water, candidates could not clearly state that hydrogen bonding occurs between molecules.
- A poor understanding of the processes involved when an ionic substance dissolves in water and the interactions between the ions and the water molecules.

In many cases candidate’s responses to the physics questions that involved mathematical calculations were poorly set out, often leading to errors. Candidates generally demonstrated a poor understanding of significant figures and often ignored units. Other areas of concern included:

- While in general candidates demonstrated an understanding of the concept of momentum, many had difficulty in applying this to the specific case given.
- A common error was to ignore direction when dealing with vector quantities.
- Candidates had difficulty in being able to change the subject of an expression to obtain a required value.
- Many candidates had difficulty with the relationship between temperature and resistance and the effect that an increasing temperature has on the resistance of a circuit.

Candidates’ responses to the biology questions showed the following areas of weakness:

- While a majority recognised the process of natural selection, many were unable to explain the process involved in the colonisation of a hostile environment by species from outside that environment.
- Few candidates demonstrated a detailed understanding of all the processes involved in photosynthesis, particularly the carbon fixation stage.
- The concepts of osmotic pressure and isotonic solutions were poorly understood.
- While candidates showed a good understanding of the concept of a gene, many found an allele a difficult concept to define.
- Candidates had a poor understanding of the structure of DNA and the mechanism of DNA replication.
- Few candidates understand how antibiotics work and why they work on bacteria and not on viruses.
- The transmission of nerve impulses and the energy involved in this process was poorly understood.
- While candidates could demonstrate a good understanding of a number of systems, knowledge of the ways in which these systems interact was poor.

In responding to the geology questions candidates showed that they did not make use of all the stimulus material available and had difficulty in applying their knowledge to a new situation. While the concept of index fossils was well understood by most candidates, many failed to distinguish between a short time and a short geological time. In describing the way in which variations in the Earth’s magnetic field can be preserved in rocks of the sea floor, candidates referred to the alignment of magnetic minerals rather than to the alignment of the magnetic fields of these minerals.