

2012 HSC Notes from the Marking Centre – Senior Science

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Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Senior Science. It contains comments on candidate responses to the 2012 Higher School Certificate examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

This document should be read along with the relevant syllabus, the 2012 Higher School Certificate examination, the marking guidelines and other support documents developed by the Board of Studies to assist in the teaching and learning of Senior Science.

General comments

Teachers and candidates should be aware that examiners may ask questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating their knowledge, understanding and skills developed through studying the course, including the prescribed focus areas. It is important to understand that the Preliminary course is assumed knowledge for the HSC course.

Candidates need to be aware that the marks allocated to the question and the answer space (where this is provided on the examination paper) are guides to the length of the required response. A longer response will not in itself lead to higher marks. Writing far beyond the indicated space may reduce the time available for answering other questions.

Candidates need to be familiar with the Board's [Glossary of Key Words](#), which contains some terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the key words from the glossary. Questions such as 'how?', 'why?' or 'to what extent?' may be asked, or verbs that are not included in the glossary may be used, such as 'design', 'translate' or 'list'.

Section I – Core

Part B

Question 21

- a. In better responses, candidates identified a light source directed through an optic fibre with a method of detection at the other end.
In weaker responses, candidates identified only a light source or a method of detection.

- b. In better responses, candidates provided a comparison between communication using optical fibres and microwaves by including two or more similarities and two or more differences.

In weaker responses, candidates simply listed properties of optical fibre and microwaves, without identifying similarities or differences.

Question 22

- a. Most candidates correctly identified two properties of silicone that make it useful in bionic implants.
- b. In better responses, candidates identified two safety precautions required when conducting an experiment to test the properties of silicone and clearly explained a reason for each stated safety precaution.

In weaker responses, candidates simply identified safety precautions without providing reasons for the safety precautions.

Question 23

In most responses, candidates listed the procedures used for CPR. In the best responses, candidates could explain how the different steps (the cause) in CPR worked to keep the patient alive (the effect). In the best responses, candidates understood that CPR was only a first-aid step and in most cases required the patient to receive further medical treatment such as defibrillation.

In weaker responses, candidates simply gave the step-by-step process of CPR without linking it to what was happening concurrently in the body.

In some responses, candidates confused CPR with other life support systems such as ventilators and heart–lung machines.

Question 24

- a. In most responses, candidates provided some aspects of a valid experiment for the given hypothesis and were able to scaffold a method that was set out in an appropriate text format.

In the best responses, candidates controlled more than one variable (ie exercise duration and exercise intensity) as well as measuring the resting and final heart rate. In these responses, candidates included a clear step to measure each participant's final heart rate under the same conditions, such as measuring the heart rate one minute after the end of exercise.

In the better responses, candidates explicitly identified the dependent, independent and controlled variables. In most responses, candidates showed that they understood the need for repetition to give more reliable results but only some commented on the steps needed to maintain validity.

In some inventive responses, candidates designed longitudinal studies that would have yielded a very valid method for investigation.

- b. In most responses, candidates identified tabulation and graphing as methods that could be used to analyse the collected data. In better responses, candidates gave details of the calculation steps that could be used to determine the difference between resting and final heart rate, and suggested that using average results over several repetitions would lead to more reliable conclusions.
- c. In most responses, candidates identified at least one factor that could affect the change in heart rate during exercise. The most commonly given response was level of fitness.

Question 25

In better responses, candidates addressed the question of assessing the impact on society. In better responses, candidates linked more people having surgery and surviving longer because of pacemakers to greater economic stress on governments or hospitals.

In weaker responses, candidates only talked about the impacts on individuals as opposed to those on society, or described a pacemaker in detail.

Question 26

In better responses, candidates clearly identified how microflora inhibit disease-causing organisms by describing the action of microflora in reducing skin pH (a hostile environment for pathogens), and stated that microflora take up space or nutrients that the pathogens need to survive and reproduce.

In weaker responses, candidates simply stated that there was a change in pH, without actually clarifying the type of change; for example it lowers pH and increases acidity.

Question 27

- a. In better responses, candidates correctly identified the sound quality of both AM and FM radio waves. In many responses, candidates stated that FM had better sound quality.
- b. In better responses, candidates clearly stated a feature of both FM and AM and linked each to its use. The most commonly stated feature of AM was that it had a long wavelength and could travel long distances, making it more useful for longer distance communication where high sound quality was not essential. The most commonly stated feature of FM was that it was a high frequency wave that provided high quality sound and was used for quality music broadcasting.
- c. In better responses, candidates showed an understanding of the modulation process and of the ways that amplitude changes in an AM wave and frequency changes in the FM wave.

In mid-range responses, candidates identified that amplitude is changed in an AM wave and that frequency is changed in an FM wave, and some made reference to the electromagnetic spectrum but did not show any understanding of the modulation process.

Question 28

In better responses, candidates recognised several benefits of using both electronic and non-electronic systems.

Question 29

- a. In most responses, candidates identified an advantage that tablets have over capsules. In better responses, candidates included reference to the speed at which a tablet can dissolve compared to a capsule. In weaker responses, candidates confused the stimulus information and did not realise that the medication needed to be dissolved in water before swallowing.
- b. In better responses, candidates identified that B was the most suitable medication and justified this with evidence from the stimulus material. In weaker responses, candidates did not link low pH to the acidic environment of the stomach and so selected an alternate medication, or misunderstood the ‘Amount of Solubility’ to mean ‘Speed of Dissolving’ on the graph axis.

Question 30

In better responses, candidates clearly related the properties of surfactants, emulsifiers and solvents to their uses on the body and included at least two examples. In better responses, candidates used appropriate scientific terminology and displayed a logical sequence of thought.

In weaker responses, candidates provided several properties and/or uses but failed to link them to the correct substances.

Section II – Options

Candidates are reminded that they are required to answer the questions from only ONE option. This should be the option that the candidate studied as part of their Year 12 course.

Question 31 – Polymers

- a. In better responses, candidates recognised that petrochemicals from fossil fuels are used to make polymers and that their source is in limited supply. In weaker responses, candidates failed to state the origin of petrochemicals, or thought polymers were replacing petrochemicals.
- b. i In better responses, candidates demonstrated sound graphing skills by clearly labelling axes and accurately plotting points linked with a line.

In weaker responses, candidates used histograms which made interpolation difficult.

- ii. In better responses, candidates interpolated by showing ‘construction’ lines or clearly indicating the point corresponding to a 300g mass, and showing an accurate reading of the other axis.

Question 32 – Preservatives and Additives

- a. In better responses, candidates clearly stated that cheeses and yogurts contained (good) bacteria that produced chemicals (bacteriocins) to inhibit the growth of (bad) bacteria. In weaker responses, candidates made general statements.
- b. i. In better responses, candidates labelled axes correctly and included correct scales, accurately plotted points and a line linking points of best fit. In weaker responses, candidates often scaled one axis incorrectly or plotted points incorrectly.
 - ii. In better responses, candidates gave a correct value for the diameter and indicated on the graph how the value was obtained using the gradient. In weaker responses, candidates gave a value without a supporting explanation.
- c. In better responses, candidates gave at least two correct examples of negative labelling of food products and explained how each could be misleading and could influence a consumer’s choice of food products. In weaker responses, candidates did not explain what negative labelling referred to, and often simply referred to false labelling of products.
- d. i. In better responses, candidates correctly showed the need for multiple references from a variety of qualified (reputable) authors. They also stated the need to cross-reference and check the dating of the source to validate the information. In weaker responses, candidates just referred to the use of books or internet.
 - ii. In most responses, candidates gave a benefit and a concern regarding the use of additives in food. In better responses, candidates showed a variety of benefits for the use of additives in food, such as to enhance colour, flavour, texture etc. In weaker responses, candidates gave a general benefit or problem associated with additives.
- e. In better responses, candidates identified a variety of preserving techniques, and explained how each of these worked in reference to reducing the amount of microbe growth (killed or inhibited). In weaker responses, candidates only raised methods of preservation or bacterial growth, without clearly linking them. Others managed to explain (linked) how one preservation method killed or inhibited the growth of bacteria.

Question 33 – Pharmaceuticals

- a. In better responses, candidates gave sound reasons for having a range of antibiotics available, such as the development of resistance through misuse of antibiotics or that people may have allergies to specific antibiotics (eg penicillin). In these responses, candidates recognised that antibiotics are not intended to be used to treat viral infections and also that it is the bacterial micro-organism that becomes immune to an antibiotic, not the patient.
- b. i. In better responses, candidates demonstrated sound graphing skills, by producing a line graph with correctly plotted data points, consistent scales and fully labelled axes.
- ii. In the best responses, candidates gave the correct interpolated value, clearly indicated how it was obtained on the graph and stated this value as required by the question's instructions.
- c. In better responses, candidates identified different structural features of both arteries and capillaries, and related these to a function for each.

In weaker responses, candidates described functions unrelated to their stated structural features, or discussed arteries and veins, instead of arteries and capillaries.

- d. i. In most responses, candidates referred to more than one way of validating the information they collected from secondary sources, and provided examples such as:
- checking multiple sources relating to the circulatory system
 - comparing the information presented
 - ensuring only reputable sources were chosen, eg government and university websites, science texts and teachers
 - checking for currency of the information
 - carrying out a first-hand investigation, eg a dissection.

In weaker responses, candidates referred to only one of the above points, and used the term 'reliable' without explaining what it meant, or referred to 'changing and controlling variables', without indicating what sort of investigation they were doing.

- ii. In most responses, candidates referred to at least one aspect of the circulatory system which enabled the body to fight bacteria, such as:
- circulating blood around the body
 - reaching all the cells
 - transporting the white blood cells
 - transporting antibiotics and nutrients dissolved in the blood
 - enabling the inflammation response.

In better responses, candidates gave a detailed description of some the above points, often referring to the roles of the white blood cells in phagocytosis and antibody

production and in releasing histamines and prostaglandins to promote the process of inflammation.

In weaker responses, candidates provided scant detail of the circulatory system's role or confused the digestive and respiratory systems with the circulatory system.

- e. In better responses, candidates demonstrated thorough knowledge of the work of two correctly named scientists who contributed to an understanding of the causes and prevention of disease, and provided links between their work and our improved understanding of disease.

In many of these responses, candidates showed the historical link between scientists, such as Lister, Pasteur and Koch, which readily allowed a logical sequence for their response.

In weaker responses, candidates provided no names, or incorrect names, for the scientists, and either confused or showed a very basic understanding of the scientists' work. In these responses, candidates used scientific terms incorrectly and provided general information about disease rather than disease caused by pathogenic micro-organisms.

Question 34 – Disasters

- a. In better responses, candidates clearly stated a property of radar and described a weather outcome that could be predicted. In weaker responses, candidates predicted a weather outcome or stated a property of radar.
- b. i In better responses, candidates demonstrated sound graphing skills by plotting the data using a line graph with correctly labelled linear scales and a line linking points or of best fit.
- ii. In better responses, candidates stated the correct value and clearly showed on the graph how this value was determined. In weaker responses, candidates stated the correct value or simply described how to determine the value.
- c. In better responses, candidates outlined how humans could increase and decrease the effects of two types of disasters. In weaker responses, candidates described how humans could increase the effects of one type of disaster and decrease the effects of another type of disaster, or how humans could increase and decrease the effects of one type of disaster.
- d. i In better responses, candidates correctly showed the need for multiple sources from a variety of qualified and reputable authors. They also stated the need to cross-reference information and check the date of the source, to validate the information.

In weaker responses, candidates only referred to the use of books or the internet. In some responses, candidates wrote the word 'experiment' or briefly described an experiment to validate the information.

- ii. In better responses, candidates correctly described an example of an energy transfer and an energy transformation related to bushfires. In the best responses, candidates correctly drew an energy flow diagram to show the changes in energy forms in a bushfire and showed how a named energy form can transfer to the surrounding in a bushfire.

In weaker responses, candidates gave an example of an energy transfer or an energy transformation.

Question 35 – Space Science

- a. In better responses, candidates understood the need for additional thrust to the increased mass of the rocket or the 'pull of gravity' which needed to be overcome. In these responses, candidates often referred to rockets breaking through or entering the atmosphere. In better responses, candidates realised that the combined weight of the rocket and fuel had to be overcome by the additional thrust provided by the booster rockets.
- b. i. In most responses, candidates demonstrated sound graphing skills, correctly drawing line graphs with clearly labelled axes and points plotted accurately.
- ii. In better responses, candidates demonstrated their ability to interpolate by using 'construction' lines or clearly marked on their line graph the value corresponding to a 300kg satellite.
- c. In better responses, candidates showed an understanding of the function of an optical telescope by describing where it might be best positioned to maximise the access to light from stars and planets, and minimise those factors that detract from this, such as smoke and dust particle pollution and city/urban light pollution, or problems with physical obstacles such as trees, buildings interfering with the line of sight of the telescope.
- d. i. In better responses, candidates provided a range of methods to ensure that information was valid, such as checking multiple sources to see if the information was consistent across a range of sources.
- ii. In better responses, candidates showed a sound understanding of the effect time in space has on human health.
- e. In better responses, candidates identified correctly a range of technologies and linked them to some of the discoveries made using each of these technologies. In these responses, candidates correctly indicated the role Australia played in the making of these discoveries and linked these to our understanding of the universe.