

Science

To maximise your chance of doing well in your HSC examination you should design a study plan to make the most effective use of your time. Don't leave your preparation to the last minute.

Use a combination of an effective study plan concentrating on the syllabus knowledge and understanding content and practise in refining examination techniques to prepare for your examination. Remember you have limited time for study.

Work out the amount of time available to study for each of your science subjects and divide that time evenly between the 3 core modules and the option you studied in class. The core modules will be approximately equally weighted in the examination.

Preparing for the HSC examination

While your teacher is your most valuable, easily accessible resource, take the opportunity to access a range of resources including libraries, museums and the media to watch, listen and read about material referred to in the syllabus. Write your own summaries collating all information early in your study program and revisit them periodically.

A useful resource for revision is NSW HSC Online website at <http://hsc.csu.edu.au>. The website provides notes for all syllabus content points, ideas for investigations, references to useful texts and links to supporting information. It also contains tips for the examination and additional resource material.

The Examination technique button on the NSW HSC Online website provides further tips for the examination. The **Resources** button identifies other resources to assist your study, including links to other web sites that support specific content points.

The 2007 HSC Advice Line will open on Monday, 8 October 2007, and will remain open until Thursday 8 November 2007. You can call the Advice Line as many times as you wish from anywhere in NSW for only 25 cents per call, no matter how long the call lasts. It is staffed by highly experienced HSC teachers who provide expert study advice over the phone to assist in your preparation for the HSC examinations. The HSC Advice Line phone number is 131112.

Use a copy of the science syllabus (Amended October 2002) to guide your study. Download and refer to the latest version from the Board of Studies website at: http://www.boardofstudies.nsw.edu.au/syllabus_hsc/

About the syllabus

The HSC examination is designed to test not only your knowledge and understanding of syllabus core content points but also your knowledge, understanding and skills from within and across modules. Questions will also require you to demonstrate your ability to address the skills in Module 9.1. This needs to form part of your thinking in your study program.

The skills module 9.1 requires you to be able to identify dependent and independent variables in an experiment, explain the concept of a fair test, discuss the use of a control, distinguish between destructive and non-destructive testing and communicate your understanding through selecting and drawing appropriate graphs when presenting and analysing data. For example, when graphing data the syllabus requires you to be able to:

- identify the independent and dependent variables in a scientific investigation and place them on appropriate axes and label the axes correctly. Typically the independent variable is plotted on the x-axis.
- ensure that the axes have linear scales that use the extent of the grid
- plot points correctly by marking the point with a cross or a circle.
- use a pencil to draw curve of best fit and a ruler to draw lines of best fit
- recognise outlier points should not necessarily be included in consideration of determining a line of best fit.

The structure of the examination

The examination will be **three hours** long, with an additional five minutes of reading time at the start, and will be very similar in style and structure to previous years papers. Make sure you understand and follow the instructions at the beginning of each section and at the beginning of each question. Questions in the examination will include multiple-choice and short-answer questions.

Familiarise yourself with the structure of the HSC science paper by viewing the previous examination papers (2001 - 2006) available on the Board of Studies website at: http://www.boardofstudies.nsw.edu.au/hsc_exams/

The Board of Studies Assessment Resource Centre or ARC site contains the HSC standards packages <http://arc.boardofstudies.nsw.edu.au/go/hsc/std-packs/> and an online multiple choice quiz for each science subject <http://arc.boardofstudies.nsw.edu.au/go/hsc/mcq/>

In the exam use the available time and plan your answers. Your answer might use dot points, diagrams and tables as well as prose. Avoid internal contradictions in your answers.

Be aware that the question stimulus provided may include material unfamiliar to you. This is provided to test your ability to apply your skills to new situations.

The keyword used in an examination question provides a guide to the depth and type of response required in the answer. A glossary of key words commonly used by the Board of Studies is available from their website at:

http://www.boardofstudies.nsw.edu.au/syllabus_hsc/glossary_keywords.html

It is important to note that these will not be the only keywords used in framing questions. You should remember that the space provided on the answer sheet is a guide to the maximum length of answer required.

Take note of the use of **plurals** in the content points, which mean that at least two examples or functions need to be identified.

Handwriting should be legible.

Practical investigations

Practical experiences are an important part of your science course. It is expected that you have planned and performed investigations as part of your studies and that you can draw on these experiences to answer specific questions. You may be required to draw on your experiences of actively planning and performing these investigations as a basis for discussion relating to experimental design, procedure and results.

Recognise and recall your safe working practices during investigations.

You may be required to draw on your knowledge and experiences in gathering, processing and analysing information. You should be able to discuss the use of tables in comparing sources of information and data for reliability and the appropriate use of models and flow charts. You should be able to discuss why a particular graph is best to display a set of information or data.

Refine your examination techniques

It is important that you do not leave questions not attempted, particularly in the higher mark questions where marking guidelines often provide opportunities for some marks to be awarded for partial responses. Be sure to read the questions carefully and don't waste time by restating the question in your answer.

Take some time to analyse the question and plan your response to make it clear and concise. You may include content points, tables and diagrams, especially in holistic questions which are based on several content points in the syllabus.

Note the number of marks allocated for the question and the number of lines for the answer.

The *Notes from the Examination Centre* (2001-2006) provide feedback about candidates' answers in the past HSC examination papers and are available on the Board of Studies website at:

http://www.boardofstudies.nsw.edu.au/hsc_exams/

Note: The 2001 and 2002 examinations contain questions testing parts of the syllabus that were removed.

Good Examination Technique.

Attempt to answer all questions from Section 1 and in the option you studied. Partial answers may score some marks.

Where appropriate show all working required to reach your answer.

Do not start your answer by repeating the question. When there are several parts to the question read them through as the parts may lead onto each other.

Make sure you bring the correct equipment to the examination. Pencils and rulers are better for questions that require drawings or graphs.

Remember to answer the question asked. You should not rely on rote-learned answers from a text book. A rote-learned answer will rarely address the specific question asked and hence will not score full if any marks.

Use the specific language and terminology of the syllabus in your responses to the questions on HSC examination. This includes understanding the difference between qualitative analysis and quantitative analysis. You also need to clearly understand what is meant by the terms validity and reliability in collecting and analysing data from first-hand investigations.

Only attempt the option that you have studied during your course.

Specific advice on Biology

Question(s) or question part(s) in Section 1 and Section II focus on Core Module 9.1. Ensure that you have revised the range of investigations you have undertaken. You should be able to describe how you designed an investigation to include a logical sequence of steps, justify the use of specific pieces of equipment, correctly identify dependent/independent variables, outline how to control variables, the need for repetition and a large sample size, and identify the risk assessments for each practical task undertaken.

Questions may ask for identification of the connections between ideas and concepts, for example:

- enzyme activity and ectotherms
- homeostasis under nervous influence and hormonal influence
- the importance of genetic variation to natural selection and evolution.

Australian examples

Students should be able to provide and elaborate on Australian examples when required, for example:

- *Responses named Australian ectothermic and endothermic organisms to changes in the ambient temperature*– e.g. Blue Tongue lizard, Green and Gold Bell frog, Red kangaroo, Fairy Penguin. It is important that students are able to identify how their chosen examples deal with increases **and** decreases in the surrounding temperature.
NSW HSC On-line (<http://hsc.csu.edu.au/biology/core/balance/>) provides clear examples of responses to temperature change by Australian organisms.
- *Describe adaptations of a range of terrestrial Australian plants that assist in minimising water loss* – Casuarina, Spinifex, Red Ironbark eucalypt
NSW HSC On-line (<http://hsc.csu.edu.au/biology/core/balance/>) describes examples of adaptations in Australian plants.

The use of Technologies

The HSC Biology Core and Option topics include specific references to the use of technologies, which can be interpreted as specialised equipment, a particular process or methodology. Students are generally required to name the technology or explain the technological processes involved. Some specific references to the use of technology include:

- *identify current technologies that allow measurement of oxygen saturation and carbon dioxide concentrations.*

or

- *compare the process of renal dialysis with the function of the kidney*

Students who are less familiar with the technologies identified above can access this information at NSW HSC On-line (<http://hsc.csu.edu.au/biology/core/balance/>).

Famous scientists

In the HSC Biology Core, and some Option topics, reference is made to the work of specific scientists who developed our biological understanding eg. of the structure of DNA, structures that control inheritance, as well as types of inheritance and the evolution of new species.

Students should be able to identify the contributions and discuss the work of each named scientist.

Common misunderstandings

- Drawing scaled diagrams of red blood cells and white blood cells requires students to use a scale.
- *Report on progress in the production of artificial blood* – you are required to know where research on artificial blood is up to, not just why research is needed.
- Many students learn the structure and function of arteries, veins and capillaries, but the syllabus requires students to compare the structure in relation to function for each kind of blood vessel.
- While many students understand *hybridisation*, the syllabus asks for *hybridisation within a species*.
- Many students confuse the process of DNA replication with protein synthesis.
- Students should distinguish between Mendel's experiments and the techniques he used.
- *Perform a first-hand investigation to model natural selection*. You should be able to relate each part of your investigation to the requirements for natural selection
- Be able to *distinguish between* the various types of pathogens, i.e know the difference between prions and viruses, or bacteria and protozoa.
- Remember that **not** all pathogens are living organisms

Specific advice on Chemistry

Question(s) or question part(s) in Section I and Section II focus on Core Module 9.1 Ensure that you have revised the range of investigations you have undertaken. You should be able to describe how you designed an investigation to include a logical sequence of steps, justify the use of specific pieces of equipment, correctly identify dependent/independent variables, outline how to control variables, the need for repetition and a large sample size, and identify the risk assessments for each practical task undertaken.

In the recent past there has been significant evidence that some candidates had a very poor knowledge of basic definitions and terminology associated with chemistry and in particular the names of laboratory equipment used in first hand investigations.

Clearly set out your responses to questions involving calculations showing all steps in the working. Using a scaffold to process the calculations can help. Express your

answers with the correct number of significant figures and remember rounding-off needs to be done at the end of the calculation. Make sure you understand the difference between decimal places and significant figures.

Know how to interpret the equations from the Data Sheet with respect to the appropriate use of arrows. The Periodic Table given provides significant data. Do not rely on your memory for atomic weights. Use the information as supplied in the Periodic Table at the back of the examination paper.

It is not enough to just know what equipment does. Revise what the syllabus asks you to be able to do. For example identifying the end result of atomic absorption spectroscopy (AAS) and how it could be used is not the same as distinguishing the purpose of the individual components of the machine in the analysis.

Remember to produce a balanced chemical equation as part of a response that requires an equation and check to make sure that you have used the correct formulae and state.

You could be asked about risk assessments which are a component of first-hand investigations. Be aware of safety requirements such as the use of gloves, goggles etc and the reasons why you should use them.

When describing laboratory equipment used in first-hand investigations or equipment setups, a labelled line diagram can assist greatly to clarify your answer.

Specific advice on Earth and Environmental science

Question(s) or question part(s) in Section I and Section II focus on Core Module 9.1 Ensure that you have revised the range of investigations you have undertaken.

Earth and Environmental Science is the study of the Earth and its processes. The course aims to provide an understanding of systems and processes in aquatic and terrestrial environments and seeks to explore changes during Earth's history. The course recognises that humans have a greater influence on the environment than any other species.

You will be provided with a data sheet representing the geological time scale. Make sure you are familiar with the components of the geological timescale, and can recognise the relationships between an eon, era, epoch and a period.

You must be able to interpret diagrammatic and graphical information accurately. In some of the best responses to longer answer questions candidates included the use of diagrams and/or tables and avoided internal contradictions. Where diagrams are used to answer a question they should have sufficient detail and clear labels to identify components and the relationship between components in the diagram. It is very important that you draw on examples, particularly relevant Australian ones, to illustrate answers.

In the past there has been evidence of confusion between the concepts of ozone depletion and effects of global warming due to the enhanced greenhouse effect. Make sure you know the differences between these two concepts and their impact on the Earth's environment. They are not the same.

Where candidates are asked to describe how they assessed the reliability of information provided by secondary sources on a topic it is important that candidates relate the reliability of information from secondary sources to the specific topic indicated in the stem of the question and not just a general topic.

Candidates should make sure that they understand the underlying principles of processes, for example that the Bradley Method of bush regeneration does not include the use of pesticides. (Option-introduced species and the Australian Environment)

Where a question asks you to address more than one aspect of the syllabus then all aspects must be addressed in the response. For example, in a question where candidates were asked to describe a hazard and its impact on people some candidates described the hazard in detail but not the impact on people. Simplistic answers such as 'people are harmed' won't attract marks.

If a question asks you to compare. You need to show how things are similar or different.

Understanding the limitations of technologies such as dating techniques is important. Carbon 14 is only useful to date sediments less than around 55000 years in age.

It is important that you are able to interpret or present information in the form of a flow chart. Questions sometimes require candidates to be able to demonstrate one or both of these skills.

Specific advice on Physics

Question(s) or question part(s) in Section I and Section II focus on Core Module 9.1 Ensure that you have revised the range of investigations you have undertaken.

Candidates of Physics are most successful when they:

- Read the whole question before beginning an answer. This will assist in planning an answer. Make sure that they are answering the relevant information in each part of the question.
- Answer the question asked. The question never says "tell me everything you know about....." so don't write everything you know associated with that aspect of the question. All questions are specifically asking about an aspect of the course and you should address those aspects specifically.
- Make sure that all aspects are covered in any questions that require multiple aspects of the course to be considered. For example if a question was asking you about AC transmission and its transformation, make sure you consider both of these aspects e.g. transmission and transformation.

- Remember to use the correct units in any quantities substituted in calculation questions. For example the data may be supplied in centimetres but the formula requires you to substitute in a value in metres. Working should be shown in calculation questions as this may result in the award of partial marks.
- Always express the answer to the appropriate number of significant figures and do not make the error of rounding off until the final step of any calculation.
- Use a pencil and a ruler to draw a diagram or a graph in answering a question. If the ruler is a clear plastic then it will be more useful if you are required to draw a straight line of best fit. Remember a curve of best fit may also be required to be drawn.

There is an emphasis in the physics examination on ensuring some questions address multiple syllabus outcomes that require integrating knowledge, understanding and skills.

Candidates are advised to know the first-hand investigations from the course and connect the skills and experiences learned from investigation to other related but more theoretical content points in the course.

Students should be familiar with the data sheet located at the back of the examination. You should be familiar with the meanings of the constants provided on this data sheet and their appropriate use. Answers to all calculations should include appropriate units.

In all calculations the values published on the data sheet are the ones required to be used in any substitution. If a calculation produces an answer which is a vector then the direction and magnitude should be indicated in the response.

If candidates are required to support their answer with a diagram then it must be recognisable and drawn in a manner that makes it useful to assist in answering the question. Labelling must be clear and accurate.

In the past there has been evidence that some candidates had a very poor knowledge of the basic definitions of specific physics terms used in the syllabus. It is essential to appropriately use the language of physics in your response to examination questions.

Specific advice on Senior Science

Use the specific language and terminology of Senior Science in your responses to the questions on HSC Senior Science examination. This includes understanding the difference between qualitative analysis and quantitative analysis. You also need to clearly understand what is meant by the terms validity and reliability.

Question(s) or question part(s) in Section I and Section II focus on Core Module 9.1. Ensure that you have revised the range of investigations you have undertaken.

When you are revising, look for perspectives such as the implications of science on society and the environment, current research applications and uses of science, nature and practice of science or historical contexts. Decide how you could describe and discuss a perspective in an examination question if you were required to.

The three core modules focus on how science and technology impacts on our lives. You need to ensure that you understand the scientific terms and ideas that are identified in these modules.

For Lifestyle Chemistry make sure you understand the basic properties of substances, such as solubility and pH and that you can distinguish between solutions, solvents, colloids, suspensions, emulsions, emulsifying agents and surfactants. You need to be able to relate physical and chemical properties of substances to their use on the human body.

When studying Medical Technology-Bionics you need to relate the structure of the organs and body systems named in the syllabus to their function. Make sure you can discuss how scientists and technologists apply this scientific understanding to develop medicinal drugs and therapeutic devices to replace damaged structures and support life during operations. You should understand non-invasive and minimally invasive medical techniques and their advantages and disadvantages.

In Information Systems you need to be able to describe, explain and discuss the ways in which different forms of energy are used and be able to describe and explain the information transfer systems, processes and energy transfer and transformation systems identified in the syllabus. The various components of the electromagnetic spectrum and the advantages and disadvantages in their use for Information and Communication Technologies should be understood. You should understand how geostationary satellites are effective as a communication device.

Glen Sawle, Manager Curriculum K-12 Science unit
Ric Morante, Senior Curriculum Adviser Science 7-12
Annie Nielsen, Node coordinator Senior Science, NSW HSC Online.
Joe Merlino, Biology specialist and Science Consultant