

Year 12 HSC course.

A Strategy to improve student literacy & HSC results. The verb scaffolds are handed out and are used for homework questions

7.1 Table of Objectives and Outcomes for example: Earth and Environmental

Step 1: Identify PFA & skills to be addressed:

	Objectives	Preliminary Course Outcomes	HSC Course Outcomes
Prescribed Focus Area	<i>Students will develop knowledge and understanding of:</i>	<i>A student:</i>	<i>A student:</i>
	1 the history of Earth and Environmental Science	P1 outlines the historical development of major Earth and Environmental Science principles, concepts and ideas	H1 evaluates how major advances in scientific understanding or technology have changed the direction or nature of scientific thinking
	2 the nature and practice of Earth and Environmental Science	P2 applies the processes that are used to test and validate models, theories and laws of science with particular emphasis on first-hand investigations in Earth and Environmental Science	H2 analyses the ways in which models, theories and laws in Earth and Environmental Science have been tested and validated
	3 applications and uses of Earth and Environmental Science	P3 assesses the impact of particular technological advances on understanding in Earth and Environmental Science	H3 assesses the impact of particular advances in Earth and Environmental Science on the development of technologies
	4 implications for society and the environment	P4 describes applications of Earth and Environmental Science which affect society or the environment	H4 assesses the impact of applications of Earth and Environmental Science on society and the environment
	5 current issues, research and developments	P5 describes the scientific principles employed in particular areas of Earth and Environmental Science research	H5 identifies possible future directions of Earth and Environmental Science research
Domain : Knowledge	6 the resources of Earth	P6 identifies the origins of Earth's resources	H6 evaluates the use of the Earth's resources
	7 the abiotic features of the environment	P7 identifies and describes the physical and chemical features of the environment	H7 discusses geological, biological, physical and chemical evidence of the evolving Australian and world environments
	8 models to explain structures and processes of change	P8 discusses the interplay between the internal and external forces which constantly reshape the Earth's surface	H8 describes models which can be used to explain changing environmental conditions during the evolution of Australia and other continents
	9 Australian resources	P9 describes and locates available resources in Australian environments	H9 evaluates the impact of resources utilisation on the Australian environment
	10 biotic impacts on the environment	P10 describes human impact on the local environment	H10 assesses the effects of current pressures on the Australian environment

Step 2: Identify skills that link topics or concepts together. Skills that may be unfamiliar for the students as they would not expect these to be questions they would be required to answer.

9.1 Earth and Environmental Science Skills

During the HSC course, it is expected that students will further develop skills in planning and conducting investigations, communicating information and understanding, scientific thinking and problem-solving and working individually and in teams. Each module specifies content through which skill outcomes can be achieved. Teachers should develop activities based on that content to provide students with opportunities to develop the full range of skills.

HSC Course Outcomes	Content
<p>A student:</p> <p>H11 justifies the appropriateness of a particular investigation plan</p>	<p>Students:</p> <p>11.1 identify data sources to:</p> <ol style="list-style-type: none"> analyse complex problems to determine appropriate ways in which each aspect may be researched determine the type of data which needs to be collected and explain the qualitative or quantitative analysis that will be required for this data to be useful identify the orders of magnitude that will be appropriate and the uncertainty that may be present in the measurement of data identify and use correct units for data that will be collected recommend the use of an appropriate technology or strategy for data collection or gathering information that will assist efficient future analysis <p>11.2 plan first-hand investigations to:</p> <ol style="list-style-type: none"> demonstrate the use of the terms 'dependent' and 'independent' to describe variables involved in the investigation identify variables that need to be kept constant, develop strategies to ensure that these variables are kept constant, and demonstrate the use of a control design investigations that allow valid and reliable data and information to be collected describe and trial procedures to undertake investigations and explain why a procedure or a sequence of procedures or the repetition of procedures is appropriate predict possible issues that may arise during the course of an investigation and identify strategies to address these issues if necessary <p>11.3 choose equipment or resources by:</p> <ol style="list-style-type: none"> identifying and/or setting up the most appropriate equipment or combination of equipment needed to undertake the investigation carrying out a risk assessment of intended experimental procedures and identifying and addressing potential hazards identifying technology that could be used during investigations and determining its suitability and effectiveness for its potential role in the procedure or investigations recognising the difference between destructive and non-destructive testing of material and analysing potentially different results of these two procedures
<p>H12 evaluates ways in which accuracy and reliability could be improved in investigations</p>	<p>12.1 perform first-hand investigations by:</p> <ol style="list-style-type: none"> carrying out the planned procedure, recognising where and when modifications are needed and analysing the effect of these adjustments efficiently undertaking the planned procedure to minimise hazards and wastage of resources carefully and safely disposing of any waste materials produced during the investigation identifying and using safe work practices during investigations <p>12.2 gather first-hand information by:</p> <ol style="list-style-type: none"> using appropriate data collection techniques, employing appropriate technologies, including data loggers and sensors measuring, observing and recording results in accessible and recognisable forms, carrying out repeat trials as appropriate <p>12.3 gather information from secondary sources by:</p> <ol style="list-style-type: none"> accessing information from a range of resources, including popular scientific journals, digital technologies and the Internet practising efficient data collection techniques to identify useful information in secondary sources extracting information from numerical data in graphs and tables as well as from written and spoken material in all its forms summarising and collating information from a range of sources identifying practising male and female Australian scientists, the areas in which they are currently working and information about their research <p>12.4 process information to:</p> <ol style="list-style-type: none"> assess the accuracy of any measurements and calculations and the relative importance of the data and information gathered identify and apply relevant mathematical formulae and concepts illustrate trends and patterns by organising data through the selection and use of appropriate methods, including

	<p>computer assisted analysis</p> <p>d) evaluate the validity of first-hand and secondary information and data in relation to the area of investigation</p> <p>e) assess the reliability of first-hand and secondary information and data by considering information from various sources</p> <p>f) assess the accuracy of scientific information presented in mass media by comparison with similar information presented in scientific journals</p>
<p>H13</p> <p>uses terminology and reporting styles appropriately and successfully to communicate information and understanding</p>	<p>13.1 present information by:</p> <p>a) selecting and using appropriate text types or combinations thereof, for oral and written presentations</p> <p>b) selecting and using appropriate media to present data and information</p> <p>c) selecting and using appropriate methods to acknowledge sources of information</p> <p>d) using symbols and formulae to express relationships and using appropriate units for physical quantities</p> <p>e) using a variety of pictorial representations to show relationships and presenting information clearly and succinctly</p> <p>f) selecting and drawing appropriate graphs to convey information and relationships clearly and accurately</p> <p>g) identifying situations where use of a curve of best fit is appropriate to present graphical information</p>
<p>H14</p> <p>assesses the validity of conclusions drawn from gathered data and information</p>	<p>14.1 analyse information to:</p> <p>a) identify trends, patterns and relationships as well as contradictions in data and information</p> <p>b) justify inferences and conclusions</p> <p>c) identify and explain how data supports or refutes an hypothesis, a prediction or a proposed solution to a problem</p> <p>d) predict outcomes and generate plausible explanations related to the observations</p> <p>e) make and justify generalisations</p> <p>f) use models, including mathematical ones, to explain phenomena and/or make predictions</p> <p>g) use cause and effect relationships to explain phenomena</p> <p>h) identify examples of the interconnectedness of ideas or scientific principles</p> <p>14.2 solve problems by:</p> <p>a) identifying and explaining the nature of a problem</p> <p>b) describing and selecting from different strategies those that could be used to solve a problem</p> <p>c) using identified strategies to develop a range of possible solutions to a particular problem</p> <p>d) evaluating the appropriateness of different strategies for solving an identified problem</p> <p>14.3 use available evidence to:</p> <p>a) design and produce creative solutions to problems</p> <p>b) propose ideas that demonstrate coherence and logical progression and include correct use of scientific principles and ideas</p> <p>VERY IMPORTANT!!!!!! Your Extended Response Question!!!!!!</p> <p>c) apply critical thinking in the consideration of predictions, hypotheses and the results of investigations</p> <p>d) formulate cause and effect relationships</p>
<p>H15</p> <p>explains why an investigation is best undertaken individually or by a team</p>	<p>The HSC course builds on the Preliminary course and further increases the students' skills in working individually and in teams. Refer to the content overview on page 14.</p>

Important:

Students receive HSC verb scaffold at beginning of Year 11.

Glossary of Key Words

Syllabus outcomes, objectives, performance bands and examination questions have key words that state what students are expected to be able to do. A glossary of key words has been developed to help provide a common language and consistent meaning in the Higher School Certificate documents. Using the glossary will help teachers and students understand what is expected in response to examinations and assessment tasks.

Account	Account for: state reasons for, report on. Give an account of: narrate a series of events or transactions	Distinguish	Recognise or note/indicate as being distinct or different from; to note differences between
Analyse	Identify components and the relationship between them; draw out and relate implications	Evaluate	Make a judgement based on criteria; determine the value of: Examine: Inquire into...
Apply	Use, utilise, employ in a particular situation	Explain	Relate cause and effect; make the relationships between things evident; provide why and/or how
Appreciate	Make a judgement about the value of	Extract	Choose relevant and/or appropriate details
Assess	Make a judgement of value, quality, outcomes, results or size	Extrapolate	Infer from what is known
Calculate	Ascertain/determine from given facts, figures or information	Identify	Recognise and name
Clarify	Make clear or plain	Interpret	Draw meaning from
Classify	Arrange or include in classes/categories	Investigate	Plan, inquire into and draw conclusions about
Compare	Show how things are similar or different	Justify	Support an argument or conclusion
Construct	Make; build; put together items or arguments	Outline	Sketch in general terms; indicate the main features of
Contrast	Show how things are different or opposite	Predict	Suggest what may happen based on available information
Critically (analyse/evaluate)	Add a degree or level of accuracy (depth, knowledge and understanding, logic, questioning, reflection and quality to analysis/evaluation)	Propose	Put forward (for example a point of view, idea, argument, suggestion) for consideration or action
Deduce	Draw conclusions	Recall	Present remembered ideas, facts or experiences
Define	State meaning and identify essential qualities	Recommend	Provide reasons in favour
Demonstrate	Show by example	Recount	Retell a series of events
Describe	Provide characteristics and features	Summarise	Express, concisely, the relevant details
Discuss	Identify issues and provide points for and/or against	Synthesise	Put together various elements to make a whole

Step 3: Complete the key word list

Account		Distinguish	
Analyse		Evaluate	
Apply		Explain	
Appreciate		Extract	
Assess		Extrapolate	
Calculate		Identify	
Clarify		Interpret	
Classify		Investigate	
Compare		Justify	
Construct		Outline	
Contrast		Predict	
Critically analyze/evaluate		Propose	
Deduce		Recall	
Define		Recommend	
Demonstrate		Recount	
Describe		Summarize	
Discuss		Synthesize	

Step 4: Test yourself!

Account		Distinguish	
	Identify components and the relationship between them; draw out and relate implications		Make a judgment based on criteria; determine the value of, examine, inquire into
Apply		Explain	
Appreciate			Choose relevant or appropriate details
	Make a judgment of value, quality, outcomes, results or size	Extrapolate	Infer what is known
Calculate		Identify	
	Make clear or plain		Draw meaning of
Classify	Arrange or include in classes/categories	Investigate	Plan, draw conclusions
Compare		Justify	
Construct		Outline	
Contrast	Make, build, put together items or arguments		Suggest what may happen based on available information
Critically analyze/evaluate		Propose	
Deduce		Recall	
Define		Recommend	Provide reasons in favour
	Show by example	Recount	
Describe		Summarize	
	Identify issues and provide points for and or against	Synthesize	

Step 5: List Earth topics and the key concepts you have studied this year using the syllabus dot points:

1

***Step 6: Organise all topic concepts under the “Prescribe Focus Area”
H1-H5 headings:***

You will need to organize key points from each topic into each the prescribed focus areas (PFA: H1, H2, H3, H4, H5)

For example:

H3 assesses the impact of particular advances in biology on the development of technologies:

Tectonic Impacts:

Environments Through Time:

Caring for the Country:

Option1. Introduced Species:

Step 7: Identify links and relationships from the four topic area concepts and start thinking about the “big picture” and common thread of Earth principles.

For example: H3 assesses the impact of particular advances in Earth on the development of technologies

Think about:

- The variety, roles and use of technology in the topic concepts above
- Relationships between each technology and how it has improved our understanding of Earth processes
- Provide specific examples
- Explain the direct impacts on society and the environment using examples
- Identify and discuss the need for continued research in the future in reference to your specific examples
- Think about limitations such as cost, equality, morals and ethics
- Use the BOS verbs carefully!
- Verbs to use include: identify, discuss, describe, compare, explain, evaluate, assess and analyse
- Always include a judgment based on specific evidence or examples you have included i.e assess or analyse

Step 8:

Create a “concept statement” paragraph or question that links as many concepts or ideas from each of the topics and remember to address the verbs in your answer. This will be anywhere from a 6 mark to an 8 mark question. 100% guarantee you will have an extended response question.

All HSC exams test concepts not straight recall!

FOR EXAMPLE:

H3 assesses the impact of particular advances in Earth and Environmental Science on the development of technologies

We can link concepts and create a statement/question such as:

“The Development of new technologies has lead to major advances in our understanding of Earth and Environmental Science processes. Assess the impact on our society and the environment”?

This question now addresses:

H1 evaluates how major advances in scientific understanding and technology have changed the direction or nature of scientific thinking

H3 assesses the impact of particular advances in Earth on the development of technologies

H4 assesses the impacts of applications of Earth on society and the environment

H5 identifies possible future directions of Earth and Environmental research

Example 1. My marking criteria you can use for the question above:

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates thorough knowledge of the technologies studied• Clearly states the relationship between each technology and how it has improved our understanding of Earth processes• Links appropriate technologies to the possible impacts on society and the environment• Relates using these technologies to discuss the need for continued research in the future	8
<ul style="list-style-type: none">• Provides some information about the technologies studied• Clearly states the relationship between each technology and how it has improved our understanding of Earth processes• Outlines an impact on society and the environment• Relates this technology to possible future research	6-7
<ul style="list-style-type: none">• Provides some information about the use of technologies in Earth• States a relationship between technology and our understanding And• Outlines the possible impacts on society and the environment OR• Identifies the need for continued research in the future	4-5
<ul style="list-style-type: none">• Provides some information about technology OR• Shows a relationship between technology and our understanding OR• Outlines an impact on society or the environment technology OR• Identifies possible areas for future research	2-3
<ul style="list-style-type: none">• Provides some relevant information	1

Step 9: Read carefully through the marking criteria to identify relationships and links between each topic and common concepts. You WILL see the pattern and realize the marking criteria are very similar for every extended response question!

Write your answer using the marking criteria as a guide then check your answer with the sample answer!!! This applies for physics, chemistry and Earth!!! Remember to use the verb scaffolds.

In your response highlight the specific Prescribed Focus Areas you have addressed!!!!!!!

Example 2:

Question 30 (7 marks)

Assess whether Australia's resources and environments would be more sustainable if the concepts of earth and environmental science were more widely understood and applied.

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a breadth or depth of knowledge and understanding of Australia's resources and environments • Clearly links better management of Australia's resources and environments to concepts of earth and environmental science • Makes a clear judgment using supporting arguments • Demonstrates a coherent and logical progression of thought and indicates a high level use of scientific principles, ideas and terminology • Includes examples 	7
<ul style="list-style-type: none"> • Has a knowledge of Australia's resources and environments • Links the management of resources and environments to concepts of earth and environmental science • Makes a clear judgment using a supporting argument • Uses appropriate terminology, progression of thought and scientific principles • Includes examples 	5-6
<ul style="list-style-type: none"> • Recalls relevant knowledge of Australia's resources and environments and/or concepts of earth and environmental science OR links knowledge of Australia's resources and environments to concepts of earth and environmental science • Uses suitable terminology and/or progression of thought • Includes at least one example 	3-4
<ul style="list-style-type: none"> • Provides some relevant information 	1-2

[illegible]

Example 3:

Question 31 (7 marks)

Evaluate how advances in knowledge in the field of earth and environmental science have given us a better understanding of the evolution of our continent and challenge us to use our resources more sustainably. Give examples in your answer.

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates a depth or breadth of knowledge and understanding of the evolution of the Australian continent and sustainable use of its resources• Gives examples of advances in knowledge• Demonstrates a depth or breadth of knowledge and understanding of relevant advances in knowledge• Clearly links the changes in advances in knowledge to an improved understanding of the Australian continent and the sustainable use of resources• Makes a clear judgement based on the supporting arguments• Demonstrates a coherent and logical progression of thought and includes correct use of scientific principles, ideas and terminology	7
<ul style="list-style-type: none">• Displays a knowledge and understanding of the evolution of the Australian continent and sustainable use of its resources• Has a knowledge and understanding of advances in knowledge and how they have changed• Gives examples of advances in knowledge• Tenuously links them to improved understanding of the Australian continent and its resources• Makes a judgement linked to the supporting arguments• Uses relevant terminology and/or progression of thought	5-6
<ul style="list-style-type: none">• Recalls relevant knowledge of the Australian continent and/or its resources and/or technology and/or attempts to link technology to an understanding of the Australian continent and/or its resources• Gives example/s of advances in technology• Gives a tenuous judgement or attempts a judgement• Uses some appropriate terminology and/or progression of thought	3-4
<ul style="list-style-type: none">• Provides some relevant information	1-2

[illegible]

Example 4:

Question 31 (7 marks)

Evaluate how knowledge of Earth's processes and environmental factors has influenced management of fragile Australian ecosystems.

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates a breadth, or depth, of knowledge and understanding of Earth's processes, environmental factors and management practices• Describes the fragile nature of Australian ecosystems• Makes a judgement• Demonstrates a coherent and logical progression of thought and includes correct use of scientific principles and ideas	6-7
<ul style="list-style-type: none">• Provides a knowledge and understanding of Earth's processes, and environmental factors and management practices• Outlines/identifies aspects of Australian ecosystems• Tenuously makes a judgement• Uses relevant terminology and/or progression of thought 6-	4-5
<ul style="list-style-type: none">• Recalls relevant knowledge of Earth's processes, AND/OR the Australian environment and or its natural resources and/or environmental practices AND/OR attempts to make a judgement• Uses some appropriate terminology and/or progression of thought	2-3
<ul style="list-style-type: none">• Provides some relevant information	1

Your Answer:

[illegible]

Step 10: Use the answer in bold to write a suitable question for each multiple-choice questions below:

Question 1

- (A) The Australian continent is not located near any plate boundaries.**
- (B) Australian earthquakes are not intense enough to generate magma.
- (C) Conservative plate boundaries are not usually associated with volcanic activity.
- (D) The ancient cratons of western and central Australia are resistant to volcanic activity.

Question 2

- (A) Lahars
- (B) Lava flows
- (C) Carbon dioxide emissions
- (D) Sulfur dioxide emissions**

Question 3

- (A) Single species extinction
- (B) Catastrophic extinction
- (C) Small extinction**
- (D) Mass extinction

Question 4

- (A) Vertebrates colonised land.
- (B) Seed-bearing plants appeared.
- (C) Aquatic invertebrates became the dominant animals.**
- (D) Giant reptiles evolved and dominated terrestrial environments.

Question 5

What is the name given to the changes in life forms at the end of the Proterozoic Eon?

- (A) The K–T extinction
- (B) The Cambrian event**
- (C) The conquest of land
- (D) The Permian–Triassic extinction

Question 6

The image shows the 150 million year old fossil, *Archaeopteryx*.



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- (A) birds evolved in to reptiles.
 - (B) the first vertebrates had feathers.
 - (C) only animals with hard body parts form fossils.
 - (D) present day organisms have developed from past life forms.**

Question 7

- (A) Hydrocarbons and oxygen**
- (B) Sulfur trioxide and water
- (C) Nitrous oxides and water
- (D) Iron and water

Question 8

- (A) Sulfur dioxide, carbon monoxide, methane
- (B) Nitrogen dioxide, carbon monoxide, water
- (C) Sulfur dioxide, nitrogen dioxide, oxygen
- (D) Methane, oxygen, water

Question 9

- (A) Deadly pathogenic organisms
- (B) The earliest organisms on Earth
- (C) **Simple photosynthetic organisms**
- (D) Organisms that can convert sulfur to energy

Question 10

- (A) Ozone is two atoms of oxygen bonded together.
- (B) **Ozone is three atoms of oxygen bonded together.**
- (C) Ozone is two molecules of oxygen bonded together.
- (D) Ozone is three molecules of oxygen bonded together.

Short answer style questions:

Step 11: This time use the sample answer to write an appropriate question. You will need to think about the general area the answer is identifying and then use your glossary of key words (verb list) to create a possible question.

REMEMBER: *HSC questions are testing the concept and your ability to apply biological principles; not simple or straight out recall!*

Question 1 (4 marks)

Heat escaping from the mantle creates convection currents that rise under the crust, creating mid-ocean ridges (MORs). The currents move horizontally from the MORs dragging the crust with them. Gravity helps pull the crust from the more elevated MORs. At the trenches the descending currents pull the crust down. Gravity also drags the crust down aided by the reduced buoyancy of the crust as it cools.

Question 2 (5 marks)

Strategy: Biological controls

Biological controls reduce pest populations by using natural predators such as insects or pathogens, which attack the pest and reduce its numbers. For example, citrus scale is an insect pest that feeds on citrus stems and leaves. Ladybird beetles can be introduced as a natural predator eliminating the citrus scale pest. Biological controls can be expensive and can become pests themselves. However they are highly successful and prevent bioaccumulation/biomagnification of pesticides. Biological controls therefore minimise the effect on non-target species.

Question 3

The development of vascular tissue by some early plants gave them an advantage in that they could grow taller and thus gain more light to photosynthesise. The vascular tissue enabled water to be absorbed by roots from deeper in the soil and be transported to all parts of the plant. The plants were also able to spread away from permanent water.

Question

Question 4

Earthquake waves cause violent shaking of the ground surface and buildings, which leads to failure of buildings if they are not well designed and well constructed. Damage can be minimised by using quality construction materials, such as reinforced concrete, and advanced engineering. For example, buildings can be placed on rollers or moveable supports to isolate them from the shaking. The introduction of building codes and planning codes prevents buildings from being poorly built in earthquake-prone areas.

Question 5

Mass extinctions are caused by large-scale catastrophic events, such as the bolide event that was thought to cause the mass extinction at the end of the Cretaceous period, large-scale glaciations or massive volcanic eruptions. Mass extinctions occur on a global scale and affect both terrestrial and marine environments. Large numbers of taxa become extinct.

Smaller extinction events are regional rather than global. Climatic change and human intervention are causes and the effects are the extinction of target groups such as the Australian megafauna and, sometimes, entire ecosystems.

