

# **South Pacific Board For Educational Assessment**



## **SOUTH PACIFIC FORM SEVEN CERTIFICATE**

### **BIOLOGY**

**Effective from January 2004**

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# SOUTH PACIFIC FORM SEVEN CERTIFICATE

## BIOLOGY

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<b>Content</b>	<b>Page</b>
Preamble	2
Aims	2
Objectives	2
Outcomes	
1. Animal Behaviour and Plant Responses	3
2. Genetics	3
3. Variation and Evolution	4
4. Techniques and Processes in Biotechnology	4
5. Plant or Animal Investigation	5
6. Contemporary Biological Issues	6
Assessment	
External Assessment	7
Internal Assessment	7
Appendices	
Practical Investigation – Assessment Schedule	9
Contemporary Biological Issue - Assessment Schedule	12
IA Summary Form (BIO-IA)	13
IA Mark Capture Form (BIO-1): Practical Investigation	14
IA Mark Capture Form (BIO-2): Contemporary Biological Issue	15
Advisory Section	
Plant or Animal Investigation: Teacher Guidelines	16
Contemporary Biological Issue: Teacher Guidelines	17
Suggested Teaching Programme	19
Useful References	20
Glossary	22

# BIOLOGY

## Preamble

This prescription defines the requirements for the South Pacific Form Seven Certificate Biology examination.

Each of the student outcomes for the course is to be read in conjunction with the Explanatory Notes given for each outcome in this prescription.

Students also require knowledge and understanding of outcomes from the Pacific Senior Secondary Certificate or an equivalent certificate, which are related to the specific outcomes of this prescription.

*This prescription is derived from the New Zealand University Entrance, Bursaries and Scholarships Biology as well as the NCEA Level 3 Biology Achievement Standards as published by NZQA.*

The course is designed for students who may undertake further studies in a tertiary institution as well as for those students who will complete their formal education at the end of Form 7.

## Aims

The aims of this course in biology are to enable students to investigate, and develop their understanding of:

1. diversity, structure, function, and interrelationships of living organisms, and their interactions with the abiotic environment;
2. genetics and evolution;
3. interactions between humans and their environment, and how these are influenced by developments in biological knowledge and technology.

The students will further develop their scientific investigative skills and deepen their appreciation of the environment and become involved in issues related to it.

## Objectives

On completing this course of study students should be able to:

- investigate and identify aspects of animal behaviour and plant responses in relation to biotic and abiotic environmental factors
- investigate an aspect of the ecological niche of an animal or a plant
- investigate and describe gene expression
- investigate and explain speciation and identify patterns of evolution, with emphasis on local and regional examples
- present reasoned judgements on any social, ethical, or environmental implications on a contemporary biological issue

- identify and explain examples of contemporary techniques used in molecular biology or biotechnology, and the influence of human needs and demands on their development and use
- focus and plan by formulating hypotheses and designing experiments
- gather information by recording qualitative and quantitative observations, and locating relevant background information
- process and interpret information using appropriate statistical and graphing procedures, identify trends, relationships and patterns, and draw conclusions and evaluate the reliability and validity of the results
- report in a well-reasoned, concise and appropriate manner with conclusions that are justified and supported by relevant data.

## OUTCOMES

### Outcome 1: Animal Behaviour And Plant Responses

- Students should be able to describe, explain and discuss biological concepts and processes relating animal behaviour and plant responses to environmental factors.
- Students should be able to explain and discuss how animal behaviour and plant responses contribute to the organism's survival.

#### *Explanatory Notes*

Biological concepts and processes relating to animal behaviour and plant responses include:

- Orientation responses (tropisms, taxes, kineses, homing, migration)
- Timing responses (annual, daily, lunar, tidal)

*Readily observable examples of plants and animals should be used to illustrate a wide range of responses. Brief coverage is expected of the likely physiological (plants) and sensory (animals) mechanisms and the environmental cues involved.*

- Interspecific and intraspecific interactions: competition, resource distribution, aggressive and cooperative interactions; predator-prey interactions; social organization.

### Outcome 2: Genetics

- Students should be able to describe, explain and discuss biological concepts and processes relating to gene expression.

#### *Explanatory Notes*

Biological concepts and processes relating to gene expression include:

- The role of DNA in gene expression: nature of the gene, DNA and RNA structure, the genetic code, DNA replication and protein synthesis (transcription, translation) and protein structure and function.

- Gene-gene interactions include: linkage, sex-linkage, collaboration, complementary genes, supplementary genes, polygenes and pleiotropy.
- Interpretation and analysis of gene-gene interaction in pedigrees and dihybrid crosses.
- Gene-environment interactions include examples of modification of phenotype by environment.
- Control of gene expression includes: simple feedback control, consequences to metabolic pathways resulting from the effect of gene mutation e.g. phenylalanine pathways and PKU.
- Examples of gene expression in humans could include: PKU, haemophilia (sex linkage), sickle-cell anaemia (pleiotropy), blood groups (multiple alleles), skin colour, height, (polygenes).

### **Outcome 3: Variation And Evolution**

- Students should be able to describe, explain and discuss biological concepts and processes relating to variation and patterns of evolution.

#### *Explanatory Notes*

1. Biological concepts and processes relating to variation include:
  - Meiosis and its role in producing variation.
  - Gene and chromosome mutations and their causes.
  - Calculation of allele frequencies from genotype data, gene pool and Hardy-Weinberg equilibrium.
  - Agents that change gene frequencies including natural selection, genetic drift.
2. Biological concepts and processes relating to patterns of evolution include:
  - Speciation
  - Ways in which speciation occurs (sympatric, allopatric, and instant speciation)
  - Reproductive isolating mechanisms that contribute to speciation (geographical, temporal, ecological, behavioural, structural barriers and polyploidy)
  - Convergent, parallel and divergent evolution (including adaptive radiation), punctuated equilibrium.

### **Outcome 4: Techniques and Processes in Biotechnology**

- Students should be able to describe, explain and discuss applications of biotechnological techniques to meet human needs and demands.

#### *Explanatory Notes*

1. Techniques include PCR, ligation, use of restriction enzymes, gel electrophoresis.

2. Applications in processes such as gene cloning, transgenesis, DNA profiling, and genome analysis.
3. Relate the application of techniques to human needs and demands.

### **Outcome 5: Plant Or Animal Investigation**

- Students should be able to carry out a practical investigation of the ecological niche of a plant or an animal.

#### *Explanatory Notes*

1. The terms 'plant and animal' may be interpreted to include algae, fungi and protozoas.
2. An investigation is an activity covering the complete process from planning to reporting and will involve students in the collection of primary data.
3. Students will investigate one aspect of an ecological niche of a plant or animal. The investigation should focus on the organism's structure, function or behaviour in relation to its environment.
4. The investigation will be conducted with teacher guidance. This means the teacher is supporting the student throughout the investigation but the whole process is student driven. Teacher's support gives general information only e.g. broad questions, resource suggestions or possible new directions.
5. Students should be provided with the opportunity to undertake research into the ecological niche and some form of trialling or checking before developing their plan into a method.
6. The report will include:
  - An introduction describing the ecological niche of the organism including the aspect investigated
  - A plan, including a purpose and final method used
  - Recorded observations, measurements and data
  - Processed data showing a trend, relationship or pattern
  - A conclusion analyzing processed data in terms of the purpose of the investigation
  - A discussion of the biological concepts or processes involved in the investigation
  - An evaluation considering the validity of the investigation e.g.
    - Reliability of the data
    - Sources of error
    - The limitations of the investigation
    - Bias

## **Outcome 6: Contemporary Biological Issues**

- Students should be able to research and present a report of their reasoned judgements on one contemporary biological issue and its implications.

### ***Explanatory Notes***

1. The research will be conducted with teacher guidance. This means the teacher is supporting the student throughout the investigation but the whole process is student driven. Teacher's support gives general information only e.g. broad questions, resource suggestions or possible new directions.
2. In research, the student collects and interprets information from mainly secondary sources. Some use of primary sources is acceptable.
3. Implications of an issue could be biological, social, ethical or environmental.
4. The discussion must include a judgement about the issue that shows consideration of the implications of the issue. A judgement is a statement of opinion that supports or opposes an aspect of the issue or an implication of the issue. The judgement must be supported with referenced or quoted information from more than one secondary source.
5. A contemporary biological issue is one that has more than one point of view.
6. The report will be a structured written document.

## ASSESSMENT

The assessment of the prescription is in two parts (external and internal assessment).

1. External Assessment: 75%
2. Internal Assessment: 25%

The principal, or his/her nominee will certify that the prescription requirements have been fulfilled.

### External Assessment

This will be a 3-hour written examination.

The external written examination will assess the following:

Animal Behaviour and Plant Responses	(30%)
Genetics	(35%)
Variation and Evolution	(20%)
Techniques and Processes in Biotechnology	(15%)

Questions may require students to give objective, sentence or short paragraph answers or to draw and interpret diagrams, tables and graphs.

All questions are COMPULSORY.

### Internal Assessment

The internal assessment will be on the following:

Plant or Animal Investigation	(15%)
Contemporary Biological Issue	(10%)

#### a) Plant or Animal Investigation

- It is expected that the investigation will require about 15 hours of class time.
- The investigation must be carried out independently.
- Students must maintain a logbook that should be submitted together with the completed report.
- The investigation must produce quantitative data and use statistical procedures. (e.g. mean, standard deviation, standard error, T-test, Chi-squared test).
- Assessment will be made using the criteria specified in Assessment Schedule in the Appendix.

**b) Contemporary Biological Issue**

- It is expected that the research will require about 10 hours of class time.
- The research must be carried out independently.
- Students are required to maintain a portfolio that must be submitted together with the completed report.
- A list of suggested topics is provided in the Advisory Section (students are not restricted to these topics). Students need to have access to a range of sources of information on the issue.
- Assessment will be made using the criteria specified in Assessment Schedule in the Appendix.

*General:*

Course work requirements, the assessment tasks and weightings given to each task should be clearly explained to students at the beginning of the year's course. Results must be clearly recorded and maintained by teachers so that accurate information on each student's progress is readily available.

At the beginning of each year, each school presenting students for the South Pacific Form Seven Certificate Biology assessment must complete an Internal Assessment Summary Form (**BIO-IA**) and forward to SPBEA by the date set down by the Director.

At the start of the year students should be given a copy of the assessment statement to be used. The assessment statement and copies of all assessment tasks and assessment schedules used, as well as a sample of student responses to all internal assessment work undertaken, must be available for verification on request until 30 November of the year of the examination.

The moderation of Internal Assessment will be done in accordance with SPBEA policy as specified from time to time.

### Assessment Schedule for Biology: *Practical Investigation*

	Acceptable	Merit	Excellent
<b>PLANNING &amp; DESIGN (14 marks)</b>			
<i>Purpose / Hypothesis / Aim</i>	Statement/prediction/question on a relationship or variable relevant to the investigation context. <b>1</b>	Statement/prediction/question based on a measurable relationship or measurable variables. <b>2</b>	Statement/prediction/question making a measurable relationship between two measurable variables that can be investigated. <b>3</b>
<i>Variable testing / Trialling</i>	Evidence of trialling of at least one variable. <b>1</b>	Evidence of trialling shows: <ul style="list-style-type: none"> <li>Testing to determine the range of the independent variable</li> </ul> <b>OR</b> <ul style="list-style-type: none"> <li>Testing to determine the best way to measure the effect on the dependent variable.</li> </ul> <b>3</b>	Evidence of trialling shows: <ul style="list-style-type: none"> <li>Testing to determine the range of the independent variable</li> </ul> <b>AND</b> <ul style="list-style-type: none"> <li>Testing to determine the best way to measure the effect on the dependent variable.</li> </ul> <b>5</b>
<i>Method</i>	<i>A feasible method.</i> Relates to the question / statement / prediction but lacks the details needed for repetition of the procedure by someone else ie: <ul style="list-style-type: none"> <li>how the dependent variable will be measured is evident</li> <li>range given for the independent variable</li> <li>some procedures stated</li> <li>some controlled variables are identified.</li> </ul> <b>2</b>	<i>A valid method.</i> Procedures can be followed to achieve similar results ie: <ul style="list-style-type: none"> <li>how the dependent variable will be measured is clear and appropriate</li> <li>appropriate range given for the independent variable</li> <li>most procedures stated</li> <li>appropriate values of controlled variables are given.</li> </ul> <b>4</b>	<i>A valid and reliable method.</i> Procedure can be followed to achieve similar and reliable results ie: <ul style="list-style-type: none"> <li>as for achievement with merit</li> <li>how the dependent variable will be measured is clear and appropriate</li> <li>appropriate range given for the independent variable</li> <li>all key procedures stated in detail.</li> </ul> <b>6</b>

<b>INFORMATION GATHERING (10 marks)</b>			
<i>Background Information (Context)</i>	Limited information relevant to the investigation context, OR Research information but has limited relevance to the investigation context.  <b>1</b>	Range of information relevant to the investigation context.  <b>3</b>	Wide range of information relevant to the investigation context. Information is sufficient to enable the results to be explained.  <b>5</b>
<i>Experimental Data</i>	Some quantitative data collected which is appropriate (or relevant) to the aim/purpose/hypothesis.  <b>1</b>	Quantitative data collected and based on the manipulation of one variable over a range appropriate to the aim/purpose/hypothesis. Raw data can be accessed for processing. <b>3</b>	Sufficient quantitative data collected to enable a valid, reliable conclusion to be made. Data lies within typical limits of accuracy of method and equipment.  <b>5</b>
<b>PROCESSING (7 marks)</b>			
<i>Tables / Graphs and Statistical Analysis</i>	Self-contained tables or graphs as appropriate for the data collected. <ul style="list-style-type: none"> <li>Graphing conventions followed</li> <li>Some minor errors may be evident.</li> </ul> <b>2</b>	Systematic and accurate processing of data. Analysis not completed to the point where the trend or relationship can be determined. (minor errors acceptable)  <b>5</b>	Data is processed to enable relevant trend/relationship/pattern (linear or non-linear) to be accurately determined. All graphical/table conventions are accurately applied. (minor errors acceptable)  <b>7</b>
<i>Calculations (If relevant)</i>	Some attempt to complete relevant calculations (ignore minor errors)  <b>(1)</b>	Relevant calculations completed accurately. Correct units given. (ignore minor errors in calculation)  <b>(3)</b>	Relevant calculations completed accurately. Units, significant figures and errors indicated appropriately. The trend/relationship is stated as a s mathematical statement. (ignore minor errors in calculation)  <b>(5)</b>

<b>INTERPRETING (13 marks)</b>			
<i>Discussion</i>	Description of the results and or conclusion. <b>1</b>	Links background information <b>or</b> the results to the context of the investigation. <b>3</b>	Explanation of the relationship between background information, experimental results and the context of the investigation. <b>5</b>
<i>Conclusion</i>	Conclusion drawn from data. <b>1</b>	Conclusion drawn from data and linked to the purpose/hypothesis/aim. <b>2</b>	Valid conclusion drawn from data and linked to the purpose/hypothesis/aim. <b>3</b>
<i>Evaluation</i>	Describes errors or problems relevant to the purpose/hypothesis/aim. <b>1</b>	Explains errors or problems in terms of validity and reliability. <b>3</b>	Critically evaluates the method in terms of accuracy, reliability and validity of the findings, sources of error and limitations of the investigation. Justifies the improvements/ modifications for further research. <b>5</b>
<b>REPORTING (6 marks)</b>			
<i>Format/ Presentation</i>	Report is organised in an appropriate format. <b>1</b>	Report is complete and references listed. <b>2</b>	Report is complete and full list of references in the approved format is given. <b>3</b>
<i>Communication</i>	Can be read but spelling and grammatical errors significantly affect overall understanding. <b>1</b>	Report sectioned and complete in own words, has errors of spelling, grammar, units, or repetition without affecting understanding. <b>2</b>	Report clear, concise and well organised in all sections. No repetition or irrelevant information – very few minor errors. <b>3</b>

- Notes: 1) Failure to reach acceptable level gains a zero mark.  
2) Assessment judgement is to the best performance standard. No marks other than those given in each section of the assessment schedule should be awarded.

**(Total: 50 marks / 55 marks if Calculations included)**

### Assessment Schedule for Biology: *Contemporary Biological Issue*

<i>ASPECT</i>	Acceptable	Merit	Excellent
<i>Portfolio</i>	Portfolio contains referenced researched material covering biological information and opinions relating to the issue.  <b>2</b>	Portfolio contains <b>a range of</b> referenced researched material covering biological information and/or opinions, relating to the issue.  <b>4</b>	Portfolio contains a range of referenced researched material covering <b>a range of</b> biological information and opinions, relating to the issue and from more than one perspective.  <b>6</b>
<i>Report</i>	Report describes: <ul style="list-style-type: none"> <li>• broad biological ideas relating to the issue</li> <li>• broad implications</li> <li>• opinions of others</li> <li>• own opinion</li> </ul> <b>4</b>	Report discusses: <ul style="list-style-type: none"> <li>• <b>specific biological information</b> relating to the issue</li> <li>• <b>specific</b> implications</li> <li>• opinions of others</li> </ul> <b>and gives:</b> <ul style="list-style-type: none"> <li>• an <b>informed judgement</b> (opinion) <b>based on the researched information</b></li> </ul> <b>8</b>	Report discusses: <ul style="list-style-type: none"> <li>• specific biological information relating to the issue</li> <li>• specific implications</li> <li>• opinions of others</li> </ul> <b>and gives:</b> <ul style="list-style-type: none"> <li>• a <b>reasoned</b> judgement supported <b>with critical evaluation of</b> the researched information.</li> </ul> <b>10</b>
<i>References</i>	Sources of copied material acknowledged within the report.  <b>1</b>	Sources of copied material acknowledged within the report <b>and</b> in a listed bibliography.  <b>2</b>	Sources of copied material acknowledged within the report and references presented in a bibliography that follows accepted conventions.  <b>4</b>

Notes: 1) Failure to reach acceptable level gains a zero mark.

2) Assessment judgement is to the best performance standard. No marks other than those given in each section of the assessment schedule should be awarded.

**(Total: 20 marks)**

# SOUTH PACIFIC FORM SEVEN CERTIFICATE

## Internal Assessment Summary Form

### BIOLOGY

*Country:* \_\_\_\_\_ *School:* \_\_\_\_\_

Task	Brief Description	Start Date	End Date	Weighting
1. Plant or Animal Investigation				15%
2. Contemporary Biological Issue				10%
	<b>Total</b>			<b>25%</b>
<i>List of topics for Contemporary Biological Issue</i>				
1.				
2.				
3.				
4.				
5.				
6.				

- Note:**
1. Be specific about dates, not just Week 3 Term 1, etc.
  2. Assessment schedules for the 2 tasks are provided in the prescription. Teachers must use these.

*Teacher:* \_\_\_\_\_





## ADVISORY SECTION

### 1. Plant or Animal Investigation

#### *Teacher Guidelines:*

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment.

- This study is designed to be an investigation of a named organism.
- This study is divided into two sections.

Section A involves students processing information from background reading and observations to briefly describe the ecological niche of the organism. This will form the introduction section of the student report and should be brief (about one page in length). It is not intended to be a major part of the study but to provide the background from which the student will select an aspect for further investigation.

Section B requires students to investigate in detail one particular aspect of the ecological niche of the organism.

- Students are required to keep a logbook in which all ideas, rough notes, brainstorming, possible investigations, collection of data and observations, research and planning, failure, successes, tentative conclusions should be kept. It is a working document and its neatness is not important – its function is to record all findings and show the student's investigative skills.

It is from this that students will write the formal report and it will be used to ensure authenticity as well as support the students' final assessment for this achievement.

- The formal scientific report should include:
  - Introduction: brief information on the organism's ecological niche relevant to the investigation from Section A.
  - Hypothesis
  - Method used
  - Results: Recorded observations, measurements and data. The data needs to be systematically recorded using tables and/or graphs. Processing of data is expected to involve use of appropriate statistical procedures.
  - Interpretation of processed data to show trends, relationships and patterns
  - Conclusions relevant to data and linked back to the hypothesis
  - Discussion of the
    - Validity and reliability of the results
    - Limitations and difficulties encountered in the investigation and suggested solutions
    - Significance of the findings in relation to the aspect of the ecological niche being studied
  - Bibliography/references/acknowledgements

## **Suggested Plants and Animals**

### Plants

Beans  
Peanuts  
Chillie  
Maize  
Mangrove  
Kumala (sweet potato)

### Animals

Lizards  
Cockroaches  
Slaters  
Toads  
Locusts  
Garden snails/slugs  
Any shellfish  
Mosquitoes

## **2. Contemporary Biological Issue**

### ***Teacher Guidelines:***

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment.

- This is designed to be an open context as long as there is current scientific evidence on both sides of the issue.
- The study is designed to be individually researched and completed over a period of time. A typical time period would include about 10 hours of classroom time.
- Portfolio must be used as a means of determining authenticity.
- Students need access to a library, and internet if possible.
- Contemporary means there is still some discussion going on over the issue at the present time.
- Issue means there is argument, dispute or debate on its impact.
- Teachers should note that students are expected to have done some formative research before attempting something of this magnitude.
- Teachers could provide a list of approved topics from which the students can choose.

The report must include a clear account of why the topic is a contemporary issue, the background, a description of both points of view, list sources of information that are scientific and authenticated. The report should include the students' own reserved judgement on the issue.

Students must have their topic approved by the teacher to decide if the topic is feasible or workable.

**Suggested Topics:**

- Pest Control
- Evolution
- Genetically Modified Organisms
- Conservation of Biological Diversity in Aquatic environment
- Human Disease control

## A Sample Biology Programme Timeline

TERM	WEEKS	TOPIC	ASSESSMENT
ONE	2 wks	Plant Behaviour and	Test
	3 wks	Animal Responses	Test
	3 wks	Practical Investigation	Internal Assessment Activity
	4 wks	Genetics (i) Molecular Genetic	Test
TWO	4 wks	(ii) Mendelian Genetic	Test
	2 wks	MID – YEAR EXAM	EXAMINATION
	5 wks	Variation & Evolution	Test
	2 wks	Contemporary Biological Issue	Internal Assessment Activity
THREE	4 wks	Techniques and Processes in Biotechnology	Test
	2 wks	FINAL EXAM	EXAMINATION

- Note:**
- 1) The above is just a suggested guideline. Teachers are free to adapt this.
  - 2) Two weeks in Term 1 have been allowed for planning and orientation.

## Useful References for Year 13 Biology

1. Bailey Meg 2000 Designs of Life Second Edition Biology for Year 13 Pearson Education.
2. Greenwood T and Allen R 2003 Year 13 Biology 2003 Biozone
3. Hanson M 2001 University Bursary and Scholarship Biology Year 13 Study Guide ESA Publications
4. Bailey M. 1999 Longman write on notes Biology Year 13 Pearson Education
5. Smith P.E. 2001 Year 13 Bio Practical Guide Educational Solutions
6. Paterson A. and Smith P.E. 1998 Examples of Evolution in New Zealand Lincoln University
7. Jarvis S 2000 Biotechnology Techniques and Issues New House
8. Lea C, Lowrie P and McGuigan S 2000 AS Biology for AQA Specification B Heinemann
9. Jones RN, Karp A and Giddings G 2001 The Essentials of Genetics Advanced Biology Readers John Murray
10. Clegg C J and Mackean D G 2000 Advanced Biology Principles and Applications John Murray
11. Campbell, Neil A and Reece, Jane B Biology 6<sup>th</sup> Ed. Benjamin Cummings (ISBN 0-8053-6624-3)

## **Other Support Material:**

### **1. Internet Resources**

- [www.studybuddy.co.nz](http://www.studybuddy.co.nz)
- [www.ema.com.au](http://www.ema.com.au)
- [www.biozone.co.nz](http://www.biozone.co.nz)
- [www.nzqa.govt.nz](http://www.nzqa.govt.nz)

### **2. Scientific Periodical / Magazines / Journals**

- New scientist
- Time
- Scientific American
- National Geographic
- Nature
- Biological Science Review

### **3. Computer Software**

- CD-ROM

### **4. Video Education Australia**

- Video Education Australia  
P.O. Box 4390  
Shortland St, Auckland, NZ
- BBC  
Endeavour / Roadshow Entertainment  
Private Bag 56905  
Dominion Road, Auckland
- Educational Media Australia  
7 Martin St  
South Melbourne, Victoria 3205

## GLOSSARY

### Experimental terms:

Hypothesis	a prediction/statement which can be tested by experimentation.
Dependent variable	variable whose value is determined by one or more other (independent) variables.
Independent variable	variable whose value is set over a range to produce a measured effect on the dependent variable.
Controlled variables	variable whose values are set throughout an experiment to prevent any effect on the dependent variable.
Valid	measures what is intended.
Reliability	probability that the same result can be produced again.
Primary data	original data obtained by direct measurement or observation of the event.
Secondary data	data from another source.

### Other terms:

Describe	requires the student to recognise, name, state the features or characteristics (of an object or process).
Explain	requires the student to show an understanding by stating what happens or giving reasons for an event or observation.
Discuss	requires the student to show an understanding by linking ideas. Usually an extended answer that explores concepts and issues and uses examples in the explanation.
Informed judgement	opinion based on an understanding of the facts/information.
Reasoned judgement	opinion based on an analysis of the facts/information.
Critically evaluate	form an opinion by comparing and contrasting information/opinions/viewpoints.
Portfolio	a set or collection of relevant information (may be from primary or secondary resources).
Concise	information presented clearly in few words.
Contemporary issue	an issue that exists at this time (rather than just in the past).
Ecological niche	functional place of an organism within ecosystem. The result of its structural adaptations, physiological responses and behaviour.
Duplication	(chromosomal) a mutation by which part of the chromosome is replicated.
Systematic (record)	record that follows a set plan or system.