

**Edexcel Advanced Subsidiary GCE in Biology
8040 and Biology (Human) 8042**

First examination 2001

**Edexcel Advanced GCE in Biology 9040 and
Biology (Human) 9042**

First examination 2002

June 2000

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Authorised by Sue Parker

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1. INTRODUCTION AND KEY FEATURES

This coursework guide accompanies the following Edexcel specifications:
Advanced Subsidiary (8040) and Advanced (9040) GCE in Biology
Advanced Subsidiary (8042) and Advanced (9042) in Biology (Human).

It has been designed to help teachers prepare their students for first assessment in Advanced Subsidiary in 2001 and Advanced GCE in 2002 and beyond.

This guide should be used in conjunction with the specification and the Teachers Guide.

The exemplar work in this guide has been assessed by Edexcel's senior examiners. Edexcel wishes to thank the schools, teachers and candidates who participated in the production of the exemplar materials.

Key Features

- Coursework contributes 15% of the total mark for both AS and Advanced GCE
- The same scheme applies to both Biology and Biology (Human)
- All AS and Advanced GCE students must complete an Individual Investigation (T1)
- Advanced GCE students must in addition complete either an Individual Study (T2) or take a written alternative test (W2)
- The Individual Investigation (T1) will be marked by the teacher and moderated by Edexcel
- The Individual Study (T2) will be marked partly by the teacher, and the written report will be marked by Edexcel

Please note that the material in Times New Roman or *Italics* in this guide has been taken directly from the specification.

2 THE COURSEWORK UNITS

The assessment of practical work is divided into two parts, **T1** The Individual Investigation and **T2** The Individual Study.

T1 is taken by all AS and Advanced GCE candidates as part of Unit 3; the topic chosen for T1 must be linked to the content of Units 1, 2 or 3;

T2 is taken by Advanced GCE candidates as part of unit 6; the topic chosen for T2 can be based on the content of any unit in the specification.

Advanced GCE candidates may take the written alternative W2 in place of T2. This is available to all Advanced GCE candidates and there are no restrictions with regard to eligibility.

For an AS examination T1 contributes 15% to the final subject mark, and for an Advanced GCE examination, T1 and T2 together (or T1 and W2 together) contribute 15% to the final subject mark.

Unit 3 will first be available in June 2001 and then in all subsequent January and June examination sessions; Unit 6 will first be available in June 2002 and then in all subsequent January and June sessions. Please see the table on page 5 of the specification.

Private Candidates and Revision Students

It is not possible to offer a written alternative paper in place of T1 for either AS or Advanced GCE candidates. For those candidates who have not had the opportunity to carry out practical coursework and have it assessed by their teacher in the normal way, a scheme for authentication of their practical work has been approved by QCA. Such candidates may include private candidates, open learning or distance learning candidates, or others studying mainly or exclusively at home. Information regarding this scheme can be obtained from the Private Candidates section. For further information, please contact the Biology Assessment Office.

3 THE SCHEME OF PRACTICAL ASSESSMENT

Both T1 and T2 each carry a total of 32 marks.

The allocation of marks to the various parts of the scheme is as follows.

6103 Unit 3: Paper 01 T1 An Individual Investigation

Planning	8 marks
Implementing	8 marks
Analysing evidence and drawing conclusions	8 marks
Evaluating evidence and procedures	8 marks

Total 32 marks

This section of the assessment is intended to give students the opportunity to plan and carry out a scientific investigation. The investigation must be quantitative and must be linked to Units 1, 2 or 3 in the AS specification.

Each student will submit for assessment the written report of the practical work carried out for the individual investigation. This report will be marked by the teacher and moderated by Edexcel.

*The practical work may be carried out by the students in different situations: for example, in a laboratory of the school or college, or as part of fieldwork. It is expected that the topic being investigated will be similar to normal experimental work carried out in the study of the specification and should be related to the biological principles covered in the specification. It is expected that the investigation will take about **3 hours of practical time**: this may vary depending on the nature of the individual investigation.*

*However, centres must ensure that students have an opportunity to work individually, even in standard situations, for example, enzyme practicals. In order to demonstrate their skills in planning, students could explore similar problems or address similar problems in unique ways. Whilst it is accepted that students may address similar areas of the specification, it is expected that all aspects of the investigation are individually produced. Shared or collaborative work will not be accepted. The practical work should involve making measurements and thus yield **quantitative** results. Before starting, students should be guided into devising an investigation which is likely to give meaningful results and can be carried out with the resources available.*

It is the responsibility of the teachers to authenticate that the work submitted from all students is individually produced. Any help given should be acknowledged by annotations on the work presented and taken into account when awarding marks. In signing the authentication certificate, teachers accept the responsibility for ensuring that these conditions have been met.

Guidance

The investigation or experiment is likely to require more time than is normally available during a practical class and it is suggested that the investigation be chosen so that it yields suitable results with *two or three hours* of practical work. Candidates may wish to make records or assemble data over a period of time, for example a series of readings could be taken at hourly intervals for one day, or observations could be made

at weekly intervals for several weeks. The investigation need not be especially elaborate, but it is expected that the results or data should be more complete and the report itself should be more detailed than for a routine laboratory experiment.

Each candidate should have the opportunity to formulate an *individual hypothesis*. It is emphasised that this need not be *novel*, but it should attempt to deal with a biological problem in a scientific way rather than simply describe a technique. The formulation of a clear straightforward hypothesis is often the key to a successful investigation.

The plan of the investigation must be submitted to the teacher for assessment before any actual practical work is done. Teachers should check that the proposed investigation is within each candidate's ability, that it can be carried out safely, and that it is likely to yield some suitable results with two or three hours of practical work. It is appreciated that the success of an experiment can never be guaranteed. If the formulation of the hypothesis and the proposed investigation seem suitable, then the teacher may give the candidate permission to proceed. If for some reason the hypothesis or design is not appropriate, the candidate should be offered the choice of trying again without assistance, or of accepting some help with a consequent lowering of the mark that can be awarded. If the second attempt is also unsuitable, then the candidate should be helped with this part of the investigation and allowed to proceed, but with the award of a lowered mark for this part. Each candidate must provide an *individual written plan*, including any amendments made, and this should be submitted with the report of the investigation, which should include a separate detailed account of the methods employed.

6106 Unit 6: Paper 01 T2 An Individual Study

<i>Planning</i>	4 marks
<i>Implementing</i>	4 marks
Introduction	4 marks
Methods	3 marks
Analysing evidence	6 marks
Discussion and evaluation	8 marks
Style	3 marks

Total 32 marks

Sections in italics are to be assessed internally by teachers.

This section of the assessment is intended to give students the opportunity to plan and carry out a scientific investigation, and to write a report of it in a style similar to that used in scientific journals. The study must be based on a quantitative investigation and may be linked to any part of the specification. Students will be required to apply and understand the significance of an appropriate statistical test.

Each student will submit for assessment the written report of the practical work carried out for the individual study. Assessment of the implementing and planning of the study will be carried out by the teacher in the centre and the written report will be externally assessed by Edexcel. Teachers or tutors responsible will be required to authenticate the work and may be asked for details as to how it was carried out.

The practical work may be carried out by the students in different situations: for example, in a laboratory of the school or college, or as part of fieldwork. It is expected that the topic being investigated will be an extension of the normal experimental work carried out in the study of the specification and should be related to the biological principles covered in the specification. Whilst it is accepted that students may address similar areas of the specification, it is expected that they will

have the opportunity to investigate individual hypotheses. The practical work must involve making measurements and thus yield **quantitative** results. A review of literature or qualitative observations or surveys **are not acceptable** for the study. The length of the written report is expected to be **about 3500 words**. Students will not be penalised for presenting longer reports but they should realise that they may have spent excessive time on the practical work or on the writing of the report, and not gained any more marks by doing so. Before starting the individual study, students should be guided into devising an investigation that is likely to give meaningful results and can be carried out with the resources available.

It is the responsibility of the teachers to authenticate that the work submitted from all students is individually produced. Any help given should be acknowledged by annotations on the work presented and taken into account when awarding marks. In signing the authentication certificate, teachers accept the responsibility for ensuring that these conditions have been met.

Guidance

Each candidate should have the opportunity to formulate an *individual hypothesis*. It is emphasised that this need not be *novel*, but it should attempt to deal with a biological problem in a scientific way rather than simply describe a technique. The formulation of a clear, straightforward hypothesis is often the key to a successful investigation.

The plan of the study must be submitted to the teacher for assessment before any actual practical work is done. Teachers should check that the proposed study is within each candidate's ability, that it can be carried out safely, and that it is likely to yield some suitable results with two or three hours of practical work. It is appreciated that the success of an experiment can never be guaranteed. Candidates should bear in mind from the outset that the data must be suitable for analysis using an appropriate statistical test. The plan should make clear how the data are to be analysed.

If the formulation of the hypothesis and the proposed investigation seem suitable, then the teacher may give the candidate permission to proceed. If for some reason the hypothesis or design is not appropriate, the candidate should be offered the choice of trying again without assistance, or of accepting some help with a consequent lowering of the mark that can be awarded. If the second attempt is also unsuitable, then the candidate should be helped with this part of the study and allowed to proceed, but with the award of a lowered mark for this part. Each candidate must provide an *individual, written* plan, including any amendments made. This should be submitted with the report of the study, which should include a separate, detailed account of the methods employed.

The study should be a *quantitative* investigation, and mathematical treatment of the results is expected. A suitable statistical test to determine the significance level of the results should be undertaken. In the discussion, candidates should give consideration as to whether or not the statistical test was appropriate and the evidence it provides for accepting or rejecting the null hypothesis.

Reports should be submitted in the style of a scientific paper and should include an abstract, summarising the aims, methods, results and outcome, together with an introduction explaining the background to the study.

4 THE PRACTICAL SKILLS CRITERIA AND THEIR APPLICATION

T1 will be teacher assessed and samples of work from selected students will be moderated by an external Moderator appointed by Edexcel. T2 will be assessed partly by the teacher in the centre and the written report will be marked by Edexcel, so the work of all students must be submitted to Edexcel.

Details of the skills to be assessed and the criteria to be used in awarding marks for T1 are given below. Criteria are also given for T2 for the guidance of teachers as to the qualities to be expected. These are the basis of the criteria used by Edexcel examiners for marking the work.

The criteria describe the level of performance expected for the award of different marks. For a student to be awarded marks at a particular level, all of the requirements described at that level need to be met. Teachers and examiners should make use of the intermediate marks if the quality of the work substantially exceeds the descriptions at the lower mark but fails to meet all the requirements at the higher mark.

A student who fails to meet the requirements for 2 marks (where this is the lowest mark described) but has made a creditworthy attempt in a section of the assessment scheme, should be given 1 mark for that section. Zero marks should only be awarded for a section when a student fails to demonstrate any achievement in that section.

All of the work assessed must be the student's own work, and this should be checked if work is done at home. Help may nevertheless be offered at any stage, provided that this is clearly stated on a student's Record Sheet and taken into account by the award of a lower mark where appropriate.

The assessments from each centre for T1 will be moderated by an external Moderator, appointed by Edexcel, who will inspect the Record Sheets and samples of coursework from selected students. The selection of coursework folders from each centre, to be inspected by the Moderator, will be carried out according to the procedures described in *Appendix 3. (OPTEMS)* The Moderator may subsequently request some more, or all, of the folders, or may occasionally arrange to visit a centre. Adjustments to marks, if necessary, to bring the standards adopted by a centre into line with those of other centres, will be made to the whole centre on the basis of the samples of work inspected.

It is not possible to offer a written alternative paper in place of T1 for either AS or Advanced GCE students. For those students who have not had the opportunity to carry out practical coursework and have it assessed by their teacher in the normal way, a scheme for authentication of their practical work has been approved by QCA. Such students may include private students, open learning or distance learning students, or others studying mainly or exclusively at home. Information regarding this scheme can be obtained from the Private Students section. For further information, please contact the Biology Assessment Office.

For T2, centres should photocopy the sample Record Sheet in *Appendix 4* of the specification or at the back of this Guide for each student. This Record Sheet must be attached to the front of each student's report of the individual study.

For both T1 and T2, the samples of work must be sent to the Moderator by 1 May for a June examination and by a date to be announced on the examination timetable for the January examination series.

Attention is drawn particularly to the third and fourth paragraphs above. For the award of a mark at a particular level **all** of the requirements for that level need to be met. Higher marks cannot be awarded if criteria at a lower level have not been met. It is therefore very important that candidates are fully aware of all the criteria by which they will be assessed and that they understand that significant omissions will seriously limit the marks that can be awarded.

Example of Complete Record Sheet
General Certificate of Education Examination

6103
Unit 3

AS BIOLOGY
AS BIOLOGY (HUMAN)

6103 UNIT 3
Paper 01 T1 Practical assessment of coursework **Record Sheet**

An Individual Investigation

Please tick the subject title: BIOLOGY BIOLOGY (HUMAN)	Examination Date	<i>June 2001</i>
	Centre Number	<i>09999</i>
	Student Number	<i>1234</i>
	Centre Name	<i>Aim High School, Nottingham</i>
	Student Name	<i>Miss D Meanor</i>

			For Moderator only
Brief title of investigation: <i>Stomatal counts in sun</i> <i>And shade areas.</i>	Planning	4/8	
	Implementing	5/8	
	Analysing evidence and drawing conclusions	3/8	
	Evaluating evidence and procedures	4/8	
Total mark for T1		16/32	

Comments for the Moderator:



Signature of teacher:

6103 Unit 3: Practical skills criteria – Planning**Maximum 8 marks**

Students should:

- i identify and define the nature of a question or problem using available information and knowledge of biology
- j choose effective and safe procedures, selecting appropriate apparatus and materials and deciding the measurements and observations likely to generate useful and reliable results
- k consider ethical implications in the choice and treatment of organisms and the environmental and safety aspects of the proposed procedures.

Marks	Planning	Marked by the teacher
2	<p>A testable hypothesis is formulated with guidance, and either the biological knowledge used to explain the nature of the problem is superficial or help is needed to select suitable knowledge.</p> <p>The plan produced is based on previously encountered or familiar procedures or further guidance is needed to develop this into a worthwhile investigation which is safe.</p> <p>Awareness of the acceptable treatment of living organisms and safe practice is limited or advice is needed.</p>	
4	<p>A testable hypothesis is formulated independently but may require some modification. Some biological knowledge and understanding is used to explain the nature of the problem but this is not always relevant or clearly linked to the stated hypothesis.</p> <p>Apparatus and procedures to be used are clearly described and the number and type of measurements or observations are adequate to generate useful and reliable results. Some important variables are identified to allow for the collection of meaningful results.</p> <p>The suggested procedure can be carried out safely without the need for further guidance and involves acceptable treatment of living organisms and the environment.</p>	
6	<p>A testable hypothesis is formulated independently and is stated in a concise form. The nature of the problem is defined using relevant biological knowledge, principles and concepts.</p> <p>The choice of apparatus and materials is justified. It is clear how the number and types of measurements or observations were chosen to generate useful and reliable results. The planned procedure describes how most variables are to be controlled.</p> <p>Some attempts are made to assess the risks of the proposed procedures; planning allows the investigation to be carried out in a safe manner with due regard to living organisms and the environment.</p>	

Marks	Planning Marked by the teacher
8	<p>A testable hypothesis is formulated independently and is stated in a concise form. The nature of the problem to be investigated is clearly defined using carefully selected and relevant biological knowledge, principles and concepts.</p> <p>The choice of apparatus and materials is fully justified. It is clear how the number and types of measurements or observations were chosen to generate useful and reliable results. The planned procedures describe clearly how all important variables are to be controlled to produce reliable results.</p> <p>Thorough risk assessments of hazardous procedures or substances are undertaken. Full consideration is given to the ethical implications of the choice and treatment of living organisms and the environment.</p>

6103 Unit 3: Practical skills criteria – Implementing Maximum 8 marks

Students should:

- l use apparatus and materials in an appropriate and safe way
- m carry out work in a methodical and organised way with due regard for safety and with appropriate consideration for the well-being of living organisms and the environment
- n make and record detailed observations in a suitable way, and make measurements to an appropriate degree of precision, using ICT (Information Communication Technology) where appropriate.

Marks	Implementing	Marked by the teacher
2	<p>Simple apparatus and materials are used with some regard to safety.</p> <p>Advice is needed to ensure safe practice and/or effective organisation. The consideration of living organisms is minimal.</p> <p>Some appropriate measurements are made with reasonable skill using basic practical procedures. These observations are recorded in lists or tables; design may be simple or less than wholly effective.</p>	
4	<p>Simple apparatus and materials are handled with reasonable competence. Simple manipulative techniques are used in an appropriate and safe manner.</p> <p>The investigation is sufficiently well organised to allow it to be completed without assistance. The work is carried out safely with sufficient regard for the well-being of living organisms and the environment.</p> <p>Measurements are made with reasonable precision. Original observations are recorded in a structured manner using suitable tables with headings and units.</p>	
6	<p>Apparatus and materials are handled competently. A range of manipulative techniques is used safely with some skill.</p> <p>The investigation is carried out in an organised, methodical and safe fashion. Due consideration is given to the well-being of living organisms and the environment.</p> <p>Measurements are made with precision and attention to detail. All original observations are recorded clearly and accurately in a suitably designed table with headings and SI units are used.</p>	
8	<p>Apparatus and materials are handled competently. A wide range of manipulative techniques is used safely and with a high degree of skill.</p> <p>The investigation is well organised and carried out in a methodical fashion with meticulous attention to safety at all times. Due consideration is given to the well-being of living organisms and the environment.</p> <p>Measurements are made to a high degree of precision and with attention to detail. Recordings are repeated to ensure that the number and type of observations are accurately linked to the hypothesis being tested. All original observations are methodically and accurately recorded in a suitable table with headings, and SI units are used.</p>	

6103 Unit 3: Practical skills criteria – Analysing evidence and drawing conclusions

Maximum 8 marks

Students should:

- o communicate biological information and ideas in appropriate ways, including tabulation, line graphs, histograms, continuous prose, annotated drawings and diagrams
- p recognise and comment on trends and patterns in data
- q draw valid conclusions by applying biological knowledge and understanding.

Marks	Analysing evidence and drawing conclusions	Marked by the teacher
2	<p>Simple line graphs or histograms are drawn to display broad trends in the collected data. There may be errors in the choice of the appropriate type of graph, axes or plotting.</p> <p>Some basic trends in the data are described.</p> <p>Conclusions drawn are superficial and make limited reference to basic biological knowledge and understanding. Help may be needed to relate the conclusion to biological knowledge and understanding.</p>	
4	<p>Summary tables of the observations and calculations are presented to illustrate trends in the data. Graphs are drawn to display these trends; the graphs are suitably labelled with the correct choice of axis for each variable.</p> <p>Trends and patterns in the data are recognised.</p> <p>Conclusions are drawn and explanations of experimental results are related to basic biological knowledge and understanding.</p>	
6	<p>Summary tables of the observations and calculations are presented to illustrate trends in the data. The selective choice of graph displays important trends and patterns in the correct format, using SI units appropriately.</p> <p>Trends and patterns in the data are clearly recognised and commented on. Some anomalies or inconsistencies are indicated.</p> <p>Explanations of experimental results are sound and clearly related to biological knowledge and understanding.</p>	
8	<p>A high degree of competence is shown in the presentation and tabulation of the collected data. Appropriate graphs are carefully chosen to display the important trends, patterns and comparisons. There is use of the correct format, including error bars where appropriate, and there is no undue repetition. SI units are used accurately at all times.</p> <p>Trends and patterns in the data are clearly recognised and commented on. All apparent anomalies and inconsistencies are described.</p> <p>Coherent, logical and comprehensive explanations of experimental results are given using carefully selected, appropriate biological knowledge and terminology.</p>	

6103 Unit 3: Practical skills criteria – Evaluating evidence and procedures

Maximum 8 marks

Students should:

- r assess the reliability and precision of experimental data and the conclusions drawn from it
- s evaluate the techniques used in the experimental activity, recognising their limitations.

Marks	Evaluating evidence and procedures	Marked by the teacher
2	<p>Analysis of the variability of results and the reliability of conclusions is very limited or considerable help is needed to make relevant comments.</p> <p>Difficulties with apparatus or measurements are described. Simple suggestions are made for further investigations or repeated measurements.</p>	
4	<p>Variability of results and apparent anomalies are discussed. Limited comments are made on the reliability of the conclusions drawn or the variation between expected and actual results.</p> <p>Comments are made on difficulties encountered when collecting data or handling apparatus. There is some attempt to explain how these may have affected the results. Reasonable suggestions are made for improved techniques.</p>	
6	<p>Variability of results and apparent anomalies are used to assess the reliability and precision of the experimental data and the conclusions drawn from them.</p> <p>Limitations of the experimental techniques employed are discussed. Proposed suggestions for further investigations would provide some additional evidence for the conclusion or extend the enquiry.</p>	
8	<p>Variability of results and apparent anomalies are used to assess the reliability and precision of the experimental data and the conclusions drawn from them. The critical analysis shows an awareness of the tentative nature of the results of single investigations.</p> <p>Limitations of the experimental techniques employed and their influence on the results are discussed in detail. Proposed suggestions for further investigations would provide considerable additional evidence for the conclusion, or for a need to extend the enquiry.</p>	

6106 Unit 6: Practical skills criteria – Planning**Maximum 4 marks**

Students should:

- t identify and define the nature of a question or problem
- u choose effective and safe procedures, selecting appropriate apparatus and materials and deciding the number of measurements likely to generate useful and reliable results
- v consider ethical implications in the choice and treatment of organisms and the environmental and safety aspects of proposed procedures.

Marks	Planning	Marked by the teacher
2	<p>A testable hypothesis is formulated independently but may require some modification.</p> <p>Apparatus and procedures to be used are clearly described and the number and type of measurements or observations are adequate for generating useful and reliable results. Some important variables are identified and controlled to allow for the collection of meaningful results.</p> <p>The suggested procedure can be carried out safely without the need for further guidance and involves acceptable treatment of living organisms and the environment.</p>	
4	<p>A testable hypothesis is formulated independently and is stated in a concise form. The planned approach shows some originality, even where familiar problems are investigated.</p> <p>The choice of apparatus and materials is fully justified. It is clear how the number and type of measurements or observations were chosen to generate useful and reliable results and provide suitable data for analysis by a named statistical test. The planned procedures describe clearly how all important variables are to be controlled to produce reliable results.</p> <p>Thorough risk assessments of hazardous procedures or substances are undertaken and full consideration is given to the ethical implications of the choice of living organisms and the environment.</p>	

6106 Unit 6: Practical skills criteria – Implementing**Maximum 4 marks**

Students should:

- w use apparatus and materials in an appropriate and safe way
- x carry out work in a methodical and organised way with due regard for safety and with appropriate consideration for the well-being of living organisms and the environment
- y make and record detailed observations in a suitable way and make measurements to an appropriate degree of precision, using ICT (Information Communication Technology) where applicable.

Marks	Implementing	Marked by the teacher
2	<p>Apparatus and materials are handled competently. A range of manipulative techniques is used safely with some skill.</p> <p>The investigation is sufficiently well organised to allow it to be completed without assistance. The work is carried out safely with sufficient regard for the well-being of living organisms and the environment.</p> <p>Measurements are made with reasonable precision. Original observations are recorded in a structured manner, using suitable tables with headings and units.</p>	
4	<p>Apparatus and materials are handled competently. A wide range of manipulative techniques is used safely and with a high degree of skill.</p> <p>The investigation is well organised and carried out in a methodical fashion with meticulous attention to safety at all times. Due consideration is given to the well-being of living organisms and the environment.</p> <p>Measurements are made to a high degree of precision and attention to detail. Recordings are repeated to ensure that the number and type of observations are accurately linked to the hypothesis being tested. All original observations are methodically and accurately recorded in a suitable table with headings, and SI units are used.</p>	

6106 Unit 6: Practical criteria – Introduction**Maximum 4 marks**

Students should:

- a identify and define the nature of a question or problem using available information and knowledge of biology.

Marks	Introduction	Marked by Edexcel
2	a Some biological knowledge and understanding is used to explain the nature of the problem but this is not always relevant or clearly linked to the stated hypothesis.	
4	a The nature of the problem to be investigated is clearly defined using carefully selected and relevant biological knowledge, principles and concepts. There is a clear and logical progression from the background information used to a statement of a concise hypothesis.	

6106 Unit 6: Practical skills criteria – Method**Maximum 3 marks**

Students should:

- a select and use a form and style of writing appropriate to the purpose
- b organise relevant material clearly and coherently
- c give an accurate account of how variables were controlled to produce meaningful results.

Marks	Method	Marked by Edexcel
1	<ul style="list-style-type: none">a The method account is disjointed or written as a list.b It is difficult to repeat the experiment from the method described.c Little attention is given to describing the precautions needed to ensure reliable or accurate results.	
2	<ul style="list-style-type: none">a The method is written in continuous prose and is easy to follow.b Some details of the methods employed are missing or the account lacks a logical sequence but it is still possible to repeat the experiment.c There is some description of the precautions taken to ensure the accuracy and reliability of the data collected.	
3	<ul style="list-style-type: none">a The method account is clear, concise and written in continuous prose.b The account follows a logical sequence and includes sufficient detail to allow the reader to replicate the procedure.c The account describes and explains all precautions taken to control variables and any amendments to the plan which were used to improve accuracy or reliability.	

6106 Unit 6: Practical skills criteria – Analysing evidence

Maximum 6 marks

Students should:

- a communicate biological information and ideas in appropriate ways, including tabulation, line graphs, histograms, continuous prose, annotated drawings and diagrams
- b recognise and comment on trends and patterns in data
- c understand the concept of statistical significance and apply a simple statistical test to data.

Marks	Analysing evidence	Marked by Edexcel
2	<ul style="list-style-type: none"> a Summary tables of the observations and calculations are presented to illustrate trends in the data. Graphs are drawn to display these trends; the graphs are suitably labelled with the correct choice of axis for each variable. b Trends and patterns in the data are recognised. c Statistical analysis is absent or is only completed with detailed guidance. Application of calculated statistical values is present, though limited or confused. 	
4	<ul style="list-style-type: none"> a Summary tables of the observations and calculations are presented to illustrate trends in the data. The selective choice of graph displays important trends and patterns in the correct format, using SI units appropriately. b Trends and patterns in the data are clearly recognised and commented on. Some anomalies or inconsistencies are indicated. c The chosen statistical test may be inappropriate or provide limited analysis of the stated hypothesis. Calculations are clearly set out but the interpretation of calculated values lacks detailed explanation. 	
6	<p>A high degree of competence is shown in the tabulation and presentation of the collected data. Appropriate graphs are carefully chosen to display the important trends, patterns and comparisons. There is use of the correct format, including error bars where appropriate and there is no undue repetition. SI units are used accurately at all times.</p> <p>Trends and patterns in the data are clearly recognised and commented on. All apparent anomalies and inconsistencies are described.</p> <p>The chosen statistical test is appropriate to the data to be analysed and the hypothesis to be tested. Calculations of statistical tests are clearly set out and interpreted, using a null hypothesis and 5% confidence levels where appropriate.</p>	

6106 Unit 6: Practical skills criteria – Discussion and evaluation

Maximum 8 marks

Students should:

draw valid conclusions by applying biological knowledge and understanding

assess the reliability and precision of experimental data and the conclusions drawn from it

evaluate the techniques used in the experimental activity, recognising their limitations.

Marks	Discussion and evaluation	Marked by Edexcel
2	<p>a Conclusions drawn are superficial and make limited reference to basic biological knowledge and understanding. Help may be needed to relate the conclusion to biological knowledge and understanding.</p> <p>b Analysis of the variability of results and the reliability of conclusions is very limited or considerable help is needed to make comments.</p> <p>c Difficulties with apparatus or measurements are described. Simple suggestions are made for further investigations or repeated measurements.</p>	
4	<p>Conclusions are drawn and explanations of experimental results are related to basic biological knowledge and understanding.</p> <p>Variability of results and apparent anomalies are discussed. Limited comments are made on the reliability of the conclusions drawn or the variation between the expected and the actual.</p> <p>Comments are made on difficulties encountered when collecting data or handling apparatus. There is some attempt to explain how these may have affected the results. Reasonable suggestions are made for improved techniques.</p>	
6	<p>Explanations of experimental results are sound and clearly related to biological knowledge and understanding.</p> <p>Variability of results and apparent anomalies are used to assess the reliability and precision of the experimental data and the conclusions drawn from them.</p> <p>Limitations of the experimental techniques employed are discussed. Proposed suggestions for further investigations would provide some additional evidence for the conclusion or extend the enquiry.</p>	
8	<p>Coherent, logical and comprehensive explanations of experimental results are given, using carefully selected, appropriate biological knowledge and terminology.</p> <p>Both sides of an argument are presented clearly and concisely when evidence from the investigation is weighed up. Variability of results and apparent anomalies are used to assess the reliability and precision of the experimental data and the conclusions drawn from them. The critical analysis shows a clear awareness of the tentative nature of the results of single investigations.</p> <p>Limitations of the experimental techniques employed and their influence on the results are discussed in detail. Proposed suggestions for further investigation would provide considerable additional evidence for the conclusion, or for a need to extend the enquiry.</p>	

6106 Unit 6: Practical skills criteria – Style**Maximum 3 marks**

Students should:

select and use a form and style of writing appropriate to the purpose and to complex subject matter
organise relevant material clearly and coherently, using specialist vocabulary where appropriate
ensure writing is legible with accurate use of spelling, grammar and punctuation in order to make meaning clear.

Marks	Style	Marked by Edexcel
1	<p>The account of the investigation is present, but lacks a detailed abstract.</p> <p>Some references are listed but it is not clear how these have been used. The account is not well organised.</p> <p>Vocabulary is limited and there are numerous errors of spelling, punctuation or grammar.</p>	
2	<p>The account of the investigation is preceded by an abstract which describes the main features of the investigation.</p> <p>References are listed but there is little evidence of their application in the account of the investigation. There is some evidence of over-elaboration or lack of organisation in the account.</p> <p>Specialist vocabulary is used but there are some errors of spelling, punctuation or grammar.</p>	
3	<p>The account of the investigation is preceded by a concise abstract describing the main aims, hypothesis, methods and results and summarising the main conclusions.</p> <p>References to sources used are clearly indicated in the body of the text in an appropriate manner. The whole account is concise and well organised.</p> <p>Good use is made of specialist vocabulary and there is accurate use of spelling, punctuation and grammar.</p>	

6 CARRYING OUT THE ASSESSMENT

Centres should make photocopies of the sample Record Sheet at the end of this guide and in Appendix 4 of the specification attach it to the front of each students work.

Timing of the assessments

Assessments may be made at any time during the course. They must be ready for submission on 1st May for a June examination or at a date to be notified (probably early December) for a January examination.

The scheme of assessment is designed to be carried out during normal teaching, but teachers may, if they wish, assess appropriate exercises in a more formal way. Candidates should be made aware of the of the assessment criteria.

Standardisation within the centre

Where work is assessed by different teachers it is essential that careful internal standardisation of marking is carried out and centres must confirm that this has been done.

Assistance

Help or advice may be offered to students who have problems with any work which is being done for the assessment. In these cases it may be appropriate to deduct one or two marks for a section, depending on the amount of help given. The nature of the help and the reduction in marks should be noted briefly on the Record Sheet.

Copying

No credit should be given for work known to have been copied directly from textbooks or from other candidates. The Biology Assessment Office must be notified if substantial amounts of copied work are submitted and this may result in disciplinary action.

Awarding marks

Teachers should read through the whole of a section before coming to a decision on the level of performance achieved and work through the criteria in ascending order before awarding marks. A clear comment on the evidence used to decide on a mark level is of enormous value to both teachers, assessors, moderators and examiners.

Completing the Record Sheet

The mark for each part of the assessment should be entered on the Record Sheet and the total marks for T1 recorded. Only sections 1 and 2 should be completed for T2. The titles of the Individual Investigation and Individual Study should also be noted briefly on the Record Sheet. Please ask a colleague to check the addition of marks on the Record Sheets. A completed example is given on page 183.

Annotating the Record Sheet and candidates work

For T1, centres should photocopy the sample Record Sheet (at the back of this guide and in Appendix 4 of the specification) for each student and attach it to the front of the students' work. Important general points such as the nature of the help given can be made on the Record Sheet but more specific detail should be indicated on the reports themselves. The students' work should be annotated with comments (as appropriate) and a simple code used to show how the marks are awarded, e.g. in the Planning criteria strand b, the award of 4 marks could be shown as Pb = 4.

Incomplete assessments

If for any reason candidates do not carry out or submit work for T1 this must be recorded on the Record Sheet by an ABS to signify that no work was done. A candidate who fails to undertake any work at all for the assessment should be recorded as ABS in all sections of the Record Sheet, including the Total Mark. No further action is necessary in cases where candidates did have the opportunity to do appropriate work.

It is, however, appreciated that problems may sometimes arise during a course which may interfere with the operation of the assessment, for example changes of teaching staff, a candidate's prolonged absence through illness or a candidate joining a course well after it has begun. In most cases it is expected that candidates will be able to carry out enough work to meet the requirements of the T1 assessment, especially as all candidates do not have to carry out the same exercises at the same times. If an assessment is incomplete for a genuine reason, a plea should be sent directly to the Special Considerations section at Edexcel, not to the Moderator, at the time of the examination giving details of the likely effect on the candidate's total assessment marks. Candidates who have no work for T2 should be entered for the alternative W2.

Coursework folders

The folder for each candidate should contain *only* the Individual Investigation (T1) or the Individual Study (T2) as appropriate.

A *simple* card or plastic folder or equivalent should be used to contain a candidate's work. Bulky ring binders should **not** be used as they add considerably to postage costs. Similarly, clear plastic wallets should **not** be used for the different sections of the work as these greatly lengthen the task of moderating.

A simple treasury tag to hold the work together is ideal. Thank you!

Authentication statement

An Authentication Statement is included on the OPTEMS sheet for T1 and on the T2 record sheets signed by the teacher. This provides an assurance that the work is the candidate's own, apart from any assistance which is permissible and identified and recorded.

7. MODERATION OF MARKS AND SUBMISSION OF COURSEWORK

Moderation of coursework

The purpose of the moderation is to review samples of coursework from different centres and to ensure that, as far as possible, marks awarded by one centre reflect the same standard as marks awarded in other centres. During the moderation procedure, the Moderators will agree upon a common standard, as shown by the majority of centres, rather than generate and impose their own standard. It is emphasised that the moderation is *not* a re-marking of individual students but a judgement of the centre as a whole.

Adjustment of marks

It may be necessary to adjust marks for some centres, to bring them into line with the standard of other centres. Adjustments may be up or down, or vary in different parts of the mark range. Normally, the rank order of students will be unchanged, though in exceptional circumstances (for example, as a result of arithmetic errors or lack of internal moderation within the centre) it may be necessary to make alterations to the rank order.

Submission of coursework

The following procedure should be used for the submission of T1 coursework.

All centres will receive Optically-read Teacher Examiner Mark Sheets (OPTEMS) for each coursework component.

Centres will have the option of:

EITHER

- recording marks on an Optically-read Teacher Examiner Mark Sheet (OPTEMS), Section 1

OR

- recording marks on computer for transfer to Edexcel by means of Electronic Data Interchange (EDI), Section 2.

Sections 3 and 4 apply whichever option is selected and deal with Coursework Record Sheets and the sample of work required for moderation.

1 Centres using OPTEMS

- 1.1 OPTEMS will be pre-printed on three-part stationery with unit and paper number, centre details and student names in student number order. A number of blank OPTEMS for students not listed will also be supplied.

The top copy is designed so that the marks can be read directly by an Optical Mark Reader. It is important therefore to complete the OPTEMS carefully in accordance with the instructions below. **Please do not fold or crease the sheets.**

- 1.2 Before completing the OPTEMS please check the subject, paper and centre details, to ensure the correct sheet is being completed.

- 1.3 All students entered by the deadline date will be listed on the OPTEMS, except those carrying forward their centre-assessed marks from the previous year. Such students will be listed on a separate OPTEMS coded T for Transferred. Any OPTEMS coded T should be checked, signed to confirm the transfer, and the top copy returned to Edexcel. No mark should be entered.
- 1.4 Late entries will need to be added in pencil either in additional spaces on the pre-printed OPTEMS or on one of the blank OPTEMS which will be supplied. Please note that full details of the centre, specification/module, paper, students' names and student numbers must be added to ALL blank OPTEMS.
- 1.5 The OPTEMS should be completed **using an HB pencil**. Please ensure that you work on a firm flat surface and that figures written in the marks box go through to the second and third copies.
- 1.6 For each student, first ensure you have checked the arithmetic on the Coursework Record Sheet, then transfer the **Total Mark** to the box of the OPTEMS labelled 'Marks' for the correct student (Please see exemplar).
- 1.7 Encode the component mark on the right-hand side by drawing a line to join the two dots inside the ellipses on the appropriate marks. Clear, dark **HB pencil** lines must be made but they must not extend outside the ellipses on either side of the two dots. Take care to remember the trailing zeros for students scoring 10, 20 etc and the leading zero for single figures, as shown.
- 1.8 If you make a mistake rub out the incorrect marks completely. Amend the number in the marks box and in the encoded section, but **please remember to amend separately the second and third copies** to ensure that the correct mark is clear.
- 1.9 Every student listed on the OPTEMS must have either a mark or one of the following codes in the marks box.
 - a 0 (zero marks) should be entered only if work submitted has been found to be worthless. It should **not** be used where students have failed to submit work.
 - b ABS in the marks box and an A in the encoded section for any student who has been absent or has failed to submit any work, even if an aegrotat award has been requested.
 - c W should be entered in the marks box and the encoded section where the student has been withdrawn.

EXEMPLAR Encoded section

Student Name	Number	Marks	
NEW ALAN* SP	3200	0	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
OTHER AMY* SP	3201	5	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
SMITH JOHN AW	3202	47	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
WATTS MARK* SP	3203	ABS	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
STEVEN JANE AW	3204	136	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
JONES ANN* AW	3205	40	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
PATEL RAJ* AW	3206	207	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)
WEST SARA SP	3207	W	(•0•) (•10•) (•20•) (•30•) (•40•) (•50•) (•60•) (•70•) (•80•) (•90•) (•100•) (•200•) (•0•) (•1•) (•2•) (•3•) (•4•) (•5•) (•6•) (•7•) (•8•) (•9•) (•A•) (•W•)

- 1.10 Where more than one teacher has assessed the work, the teachers' initials or set number should be given to the right of each student's name as illustrated.
- 1.11 The authentication and internal standardisation statement on the OPTEMS must be signed. **Centres are reminded that it is their responsibility to ensure that internal standardisation of the marking has been carried out.**
- 1.12 Once completed and signed the three-part sets should then be divided and despatched, or retained as follows:
- top copy** to be returned direct to Edexcel in the envelope provided **to be received by 1 May for the May/June examination series, and a date to be announced on the examination timetable for the January examination series.** Please remember this form **must not be folded or creased.**
 - Second copy** to be sent **with the sampled coursework** as appropriate (see Section 4) to the moderator. The name and address of the moderator will either be printed on the OPTEMS or supplied separately.
 - Third copy** to be retained by the centre

2 Centres using EDI

- 2.1 Marks must be recorded on computer and transmitted to Edexcel by **1 May for the May/June examination series, and a date to be announced on the examination timetable for the January examination series.** They must be recorded in accordance

with the specifications in the booklet ‘Formats for the Exchange of Examination Related Data using Microcomputers’. Each mark has a status as well as a value. Status codes are:

- V – valid non-zero mark recorded; student not pre-selected as part of the sample for moderation
- S – valid non-zero mark recorded and student included in sample for moderation (refer to OPTEMS and Section 4)
- Z – zero mark recorded for work submitted
- N – no work submitted but student **not** absent
- A – absent for component
- M – missing mark; no information available about the student’s previous performance
- F – mark carried forward from a previous examination series. (If the mark status is ‘F’, then no mark follows.)

The OPTEMS provided will indicate, with asterisks, the students whose work is to be sampled, where this is pre-selected (see Section 4).

2.2 Printout

Centres are required to produce a printout of the centre-assessed marks and annotate it as described below, before forwarding it **together with the sampled coursework** as appropriate (see Section 4) to the moderator, **to be received by 1 May for the May/June examination series, and a date to be announced on the examination timetable for the January examination series**. The name and address of the moderator will either be printed on the OPTEMS or supplied separately.

- ABS – absent
- W – withdrawn
- * – sampled student
- ✓ – additional sampled students.

Where more than one teacher has assessed the work the teachers’ initials or the set number should be given beside each student’s name.

Centres are reminded that it is their responsibility to ensure that internal standardisation of the marking is carried out. The following **authentication** and internal standardisation statement should be written at the bottom of the printout and signed by the teacher responsible:

‘I declare that the work of each student for whom marks are listed is, to the best of my knowledge, the student’s own and that where several teaching groups are involved the marking has been internally standardised to ensure consistency across groups.’

Signed Date

Centres are advised to retain a copy of the annotated printout.

3 Coursework Record Sheets

A copy of the Coursework Record Sheet is provided on page 100 for centres to photocopy. The Coursework Record Sheet, to be completed for each student, provides details for the moderator of how each student’s total mark is reached. It is the teacher’s responsibility to ensure that:

- all marks are recorded accurately and that the arithmetic is correct

- the total mark is transferred correctly onto the OPTEMS or via EDI
- any required authentication statement is signed by the student and/or teacher as appropriate.

Where a student's work is included in the sample the coursework record sheet should be attached to the work.

4 Sample of Work for Moderation

4.1 **Where the pre-printed OPTEMS is asterisked** indicating the students whose work is to be sampled, this work, together with the second copy of the OPTEMS, should be posted to reach the moderator by 1 May for students seeking certification in the summer series, and **a date to be announced on the examination timetable** for students seeking certification in the January series. The name and address of the moderator will either be printed on the OPTEMS or supplied separately.

In addition, the centre must send the work of the student awarded the **highest** mark and the work of the student awarded the **lowest** mark, if these are not already included within the initial samples selected. The centre should indicate the additional samples by means of a tick (✓) in the left hand column against the names of each of the students concerned.

For all sampled work the associated record sheet must be attached to each student's work.

If the pre-selected sample does NOT adequately represent ALL parts of the entire mark range for the centre, additional samples in the range(s) not covered should also be sent to the moderator. As above additional samples should be indicated by means of a tick (✓).

For centres submitting marks by EDI the students in the sample selected on the OPTEMS should be marked with an asterisk (*) or a tick (✓), as appropriate, on the EDI printout. The annotated printout must be sent to the moderator with the sample of work.

4.2 **Where the pre-printed OPTEMS is not asterisked and**

- **there are eleven or fewer students**, the coursework of ALL students together with the second copy of the OPTEMS should be posted to reach the moderator by **1 May for the May/June examination series, and a date to be announced on the examination timetable for the January examination series**. The moderator's name and address will either be printed on the OPTEMS or supplied separately. The associated record sheet must be attached to each student's work.
- **there are more than eleven students**, the centre should send the second copy of the OPTEMS or the annotated EDI printout to reach the moderator by **1 May for the May/June examination series, and a date to be announced on the examination timetable for the January examination series**. The moderator's name and address will either be printed on the OPTEMS or supplied separately. The moderator will advise the centre of the students whose work, with the associated record sheet, should be posted to him/her by return.

4.3 **In all cases** please note that the moderator may request further samples of coursework, as required and the work of all students should be readily available in the event of such a request.

Internal standardisation

Centres are reminded that it is their responsibility to ensure that where more than one teacher has marked the work, internal standardisation has been carried out. This procedure ensures that the work of all students at the centre is marked to the same standards. The statement confirming this on the OPTEMS or the EDI printout must be signed.

The procedure for submission of T2 coursework is described below.

Teachers should follow the same timetable and procedure as for T1 in awarding marks. For T2 marks should only be awarded for Planning and Implementing. Teachers will be sent an attendance register as a checklist. Teachers must submit a record sheet and folder with the individual study for every candidate. If work is not available by the due date, the candidate should be transferred to W2 instead.

No decision has yet been made about the return of T2s to centres. Candidates who wish to have a record of their work are advised to keep a photocopy of it.

**AS BIOLOGY
AS BIOLOGY (HUMAN)**

6103 UNIT 3

Paper 01 T1 Practical assessment of coursework

Record Sheet

An Individual Investigation

Please tick the subject title: BIOLOGY BIOLOGY (HUMAN)	Examination Date	
	Centre Number	
	Student Number	
	Centre Name	
	Student Name	

			For Moderator only
Brief title of investigation:	Planning	/8	
	Implementing	/8	
	Analysing evidence and drawing conclusions	/8	
	Evaluating evidence and procedures	/8	
Total mark for T1		/32	

Comments for the Moderator:



Signature of teacher:

An Individual Study

Please tick the subject title: BIOLOGY BIOLOGY (HUMAN)	Examination Date	
	Centre Number	
	Student Number	
	Centre Name	
	Student Name	

			For Examiner only
Brief title of study:	Planning (marked by the teacher)	/4	
	Implementing (marked by the teacher)	/4	
	Introduction		/4
	Methods		/3
	Analysing evidence		/6
	Discussion and evaluation		/8
	Style		/3
Total mark for T2			/32

Comments for the Examiner:

By signing this form and the attendance register the teacher declares that the work of this student is, as far as is known, the student's own and that marking has been internally standardised across teaching groups where appropriate.



Signature of teacher:

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