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Course Goals

IB Biology SL1 is the first year of a two-year course. The major goal is a broad, general understanding of the principles of biology. Four basic concepts are followed throughout the course: structure and function, universality versus diversity, equilibrium within systems, and evolution. Students will have challenging opportunities for scientific study. (Adapted from I.B. Diploma Programme Guide: Biology, 2007).

Beliefs

The purpose of the study of biology is to understand the nature of living things through the investigation of the relationships between structure and function, genetic and ecological diversity, and stability and change in living systems. In order to appreciate the purpose of biology, one must believe that experiments can be designed to evaluate a scientific question critically. However, one must also believe that scientific knowledge and the experimentation are not free from error.

Essential Questions

1. What are living things? How do living things interact internally, with other organisms, and with their environment? How do living things change over time?
2. What are the scientific justifications for stewardship of estuaries?

Theory of Knowledge Area of Knowledge Questions

1. To what extent do scientists rely on either confirming or falsifying a hypothesis? Is either approach straightforward? What does this tell us about the nature of the scientific endeavour? Is there a single scientific method used in the natural sciences and distinct from methods of the other areas of knowledge?
2. Is science, or ought it to be value-free? What implications does your answer have for the regulation of science? Who should decide whether particular directions in research are pursued?

Course Objectives

Core IB Biology **content** studied will include

- Statistical analysis
- Cells
- Chemistry of life
- Genetics and genetic engineering
- Cell respiration and photosynthesis
- Ecology and evolution

Extended study will also be carried out in one option (two options are required over the two years) on further ecology & conservation (Option G).

Internal assessment (IA) comprises individual and small group laboratory activities and; the IA component will incorporate teacher and student-designed activities.

Skills incorporated (Adapted from IB Diploma Programme Guide: Biology, 2007 and Massachusetts Biology High School Standards, 2006) throughout the course include

- following procedures and instructions
- designing and carrying out a scientific investigation
- predicting, explaining and interpreting scientific results
- recognizing possible sources of error and limitations in science
- communicating and writing scientifically
- applying mathematical skills to solve problems in biology
- using appropriate technology as scientific tools
- being aware of moral, ethical, social, economical and environmental implications of using science and technology

Expectations of attitudes are that all students show cooperation, perseverance and responsibility appropriate for effective scientific investigations, problem solving and study in biology.

Cross-disciplinary connections (with examples) include links to other natural sciences (Group 4 Project), mathematics (IA data analysis, solving pedigrees, calculating ecological diversity), ethics (IB animal experimentation policy, stem cell research, reproductive technology), history (classical experiments, key scientists), social sciences (social implications of HIV infection, economic importance of fishing management), literature (technical writing and fictional accounts of biological concepts), and visual arts (biological illustration, animation of cellular processes).

Extra-help is available after school on Mondays, 3.15-4.15 p.m., or by prior arrangement.

Teaching Strategies & Resources

Learning experiences will include student and teacher-designed hands-on laboratory or field investigations, cooperative group work, student presentations, and authentic problem solving. Teaching strategies will serve to model the nature of scientific work and to meet the needs of students with diverse learning preferences.

Resources will include the text *Biology for the IB Diploma* by Clegg (Hodder Murray), *IB Study Guides: Biology for the IB Diploma* by Allott (Oxford University Press), *Senior Biology 1 and 2: Student Resource and Activity Manual* (Biozone), as well as lab equipment, the Internet, scientific journal and news articles, teacher handouts, video, and simulation computer programs.

Assessment will include:

- Classwork. Students are expected to engage in a range of tasks, including note-taking, Internet research, presentations, review, class discussions and working cooperatively with their fellow students.
- Reading and homework assignments (about 30-45 minutes). Serious effort is essential.
- Quizzes and tests. Quizzes are normally announced at least one day in advance and evaluate material covered over 1-4 lessons. Tests are usually announced at least one week in advance and evaluate material studied over two or more weeks. Questions will model a variety of types of IB Biology examination questions.
- Internal Assessment (IA). IA activities may include teacher and student-designed lab investigations, data collection and analysis, drawing inferences, and evaluating methods and the quality of data.
- Attendance and adherence to deadlines are important to successful progress in the course. Regular absences and late or missed assignments without excuse will have a detrimental impact on the grade earned in the course.
- Grades will be based on tests/quizzes (60%), internal assessment (25%), homework/classwork (15%). Feedback on class participation in activities and homework submitted on time will be updated weekly; feedback on major tests and IA will include student self-evaluation along with teacher comments and given marks shared within one rotation cycle of the class schedule.

Required daily materials

- Covered textbooks (specific titles as needed)
- One three-ring binder for notes, handouts, and tests
- Clear, plastic sheet protectors for submitting internal assessments
- Graphing calculator for calculations, data entry and statistical analysis
- Blue or black pen, pencil, set of colored pencils and a straight edge (15-30cm ruler)

Assessment Criteria

Classwork ranges from arriving to class on time and prepared, asking questions, listening attentively, participating actively and responsibly in lab or field work, and engaging in all learning experiences. Daily general class participation marks, based on teacher-observation, will range from 0-3, although class activities often extend to written homework. **Homework** may include notes on readings, data analysis, and practice IB questions. Daily homework marks will range from 0-3 and reflect mainly effort; more formal written homework will be marked at IB standards like test questions described next, and range up to about 20 marks.

Rubrics

Daily class participation—what to do? Be on time; have daily materials at hand; contribute to class discussions by asking questions and/or posing answers; demonstrate active listening by building on peer contributions; adhere to all lab rules; adhere to the IB animal experimentation policy; be perseverant in individual and group work

Daily homework—what to do? Complete assignments on time; submit written work typed or printed neatly in dark blue or black pen (pencils may be used for graphs and drawings); follow instructions, show evidence of an attempt to understand difficult work

0 rarely

1 occasionally

2 frequently

3 (near to) or always demonstrates descriptors

Test and quiz responses will be marked at IB standards. Generally, the value of multiple-choice questions (MCQ) is 1 mark, while longer written responses (Paper 2 Part B ‘the essays’) vary from about 3-9 marks. Short-answer questions and data-based questions (DBQ) are often comprised of multiple parts, and the total value may range from a handful to roughly 20 marks. Mark values are typically shown in []. You should keep in mind that IB marks positively; that is, you earn marks for what you show you know. Marks are always shown as positive numbers, never deductions.

Internal assessment is the set of lab, field or modelling activities and corresponding analytical reports carried out over the course of the two-year programme. IA activities are assessed against marking criteria common to all IB Group 4 subjects (except the trans-disciplinary ESS). The IB assessment criteria rubrics are attached below:

Criteria and aspects

There are five assessment criteria that are used to assess the work of both SL and HL students.

- Design—D
- Data collection and processing—DCP
- Conclusion and evaluation—CE
- Manipulative skills—MS
- Personal skills—PS

The first three criteria—design (D), data collection and processing (DCP) and conclusion and evaluation (CE)—are each assessed twice.

Manipulative skills (MS) is assessed summatively over the whole course and the assessment should be based on a wide range of manipulative skills.

Personal skills (PS) is assessed once only and this will be during the group 4 project.

Each of the assessment criteria can be separated into three **aspects** as shown in the following sections. Descriptions are provided to indicate what is expected in order to meet the requirements of a given aspect **completely** (c) and **partially** (p). A description is also given for circumstances in which the requirements are not satisfied, **not at all** (n).

A “complete” is awarded 2 marks, a “partial” 1 mark and a “not at all” 0 marks.

The maximum mark for each criterion is 6 (representing three “completes”).

D	× 2 = 12
DCP	× 2 = 12
CE	× 2 = 12
MS	× 1 = 6
PS	× 1 = 6

This makes a total mark out of 48.

The marks for each of the criteria are added together to determine the final mark out of 48 for the IA component. This is then scaled at IBCA to give a total out of 24%.

General regulations and procedures relating to IA can be found in the *Vade Mecum* for the year in which the IA is being submitted.

Design

Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Defining the problem and selecting variables	Controlling variables	Developing a method for collection of data
Complete/2	Formulates a focused problem/research question and identifies the relevant variables.	Designs a method for the effective control of the variables.	Develops a method that allows for the collection of sufficient relevant data.
Partial/1	Formulates a problem/research question that is incomplete or identifies only some relevant variables.	Designs a method that makes some attempt to control the variables.	Develops a method that allows for the collection of insufficient relevant data.
Not at all/0	Does not identify a problem/research question and does not identify any relevant variables.	Designs a method that does not control the variables.	Develops a method that does not allow for any relevant data to be collected.

Data collection and processing

Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Recording raw data	Processing raw data	Presenting processed data
Complete/2	Records appropriate quantitative and associated qualitative raw data, including units and uncertainties where relevant.	Processes the quantitative raw data correctly.	Presents processed data appropriately and, where relevant, includes errors and uncertainties.
Partial/1	Records appropriate quantitative and associated qualitative raw data, but with some mistakes or omissions.	Processes quantitative raw data, but with some mistakes and/or omissions.	Presents processed data appropriately, but with some mistakes and/or omissions.
Not at all/0	Does not record any appropriate quantitative raw data or raw data is incomprehensible.	No processing of quantitative raw data is carried out or major mistakes are made in processing.	Presents processed data inappropriately or incomprehensibly.

Conclusion and evaluation

Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Concluding	Evaluating procedure(s)	Improving the investigation
Complete/2	States a conclusion, with justification, based on a reasonable interpretation of the data.	Evaluates weaknesses and limitations.	Suggests realistic improvements in respect of identified weaknesses and limitations.
Partial/1	States a conclusion based on a reasonable interpretation of the data.	Identifies some weaknesses and limitations, but the evaluation is weak or missing.	Suggests only superficial improvements.
Not at all/0	States no conclusion or the conclusion is based on an unreasonable interpretation of the data.	Identifies irrelevant weaknesses and limitations.	Suggests unrealistic improvements.

Manipulative skills (assessed summatively)

This criterion addresses objective 5.

Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Following instructions*	Carrying out techniques	Working safely
Complete/2	Follows instructions accurately, adapting to new circumstances (seeking assistance when required).	Competent and methodical in the use of a range of techniques and equipment.	Pays attention to safety issues.
Partial/1	Follows instructions but requires assistance.	Usually competent and methodical in the use of a range of techniques and equipment.	Usually pays attention to safety issues.
Not at all/0	Rarely follows instructions or requires constant supervision.	Rarely competent and methodical in the use of a range of techniques and equipment.	Rarely pays attention to safety issues.

*Instructions may be in a variety of forms: oral, written worksheets, diagrams, photographs, videos, flow charts, audio tapes, models, computer programs, and so on, and need not originate from the teacher.

See "The group 4 project" section for the personal skills criterion.