**Higher Level Biology – Class Handbook**

**Greenville High School**

**International Baccalaureate Program**

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**Welcome to IB HL Biology!**

Welcome!

We are about to leave on a two year journey through the subject of biology.

Our main goal is to pass the IB exam in the area of biology, while remembering to have fun and enjoy our quest together to this ultimate goal. I also ask that you enjoy the endeavor you are about to embark or should I say we are about to embark on. You will be an active learner and hopefully learn new skills that will strengthen you as a learner in many subjects. We must work together as a team or as a family, which is how I like to see it, in order to make our journey a prosperous and rewarding one for all of us. This is a new adventure for all of us and it is vital for our success to work together to navigate our path ahead.

We will keep very busy in the process of attaining these goals. If you learn and understand the material presented to you over these two years, you will do extremely well on the exam. It is important that you ask questions when you don’t understand a concept. Your questions are a very important part of this class. We must work together to make the class as educational and interesting as possible.

This class handbook guide will help us get through the challenging and demanding Higher Level Biology course. It contains much of what you need know for the two year course, as well as some great help with your exams and internal assessments. Please use this book

regularly and check that you are keeping up with the vast amount of content that you will be required to remember. Many other supplements will be provided that will be critical for your success. Organization will be key in order for you to keep track of all of your resources.

**It is very important that this handbook become part of your biology notes. Please**

**keep it available for use in class and outside of class. It is obviously quite**

**long, but it is also extremely important.**

IB Learner Profile:

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world. IB learners strive to be:

**Inquirers** They develop their natural curiosity. They acquire the skills necessary to

 conduct inquiry and research and show independence in learning*.* They

 actively enjoy learning and this love of learning will be sustained

 throughout their lives.

**Knowledgeable** They explore concepts, ideas and issues that have local and global

 significance. In so doing, they acquire in-depth knowledge and develop

 understanding across a broad and balanced range of disciplines.

**Thinkers** They exercise initiative in applying thinking skills critically and creatively

 to recognize and approach complex problems, and make reasoned, ethical

 decisions.

**Communicators** They understand and express ideas and information confidently and

 creatively in more than one language and in a variety of modes of

 communication. They work effectively and willingly in collaboration with

 others.

**Principled** They act with integrity and honesty, with a strong sense of fairness,

 justice and respect for the dignity of the individual, groups and

 communities. They take responsibility for their own actions and the

 consequences that accompany them.

**Open-minded** They understand and appreciate their own cultures and personal

 histories, and are open to the perspectives, values and traditions of

 other individuals and communities. They are accustomed to seeking and

 evaluating a range of points of view, and are willing to grow from the

 experience.

**Caring** They show empathy, compassion and respect towards the needs and

 feelings of others. They have a personal commitment to service, and act

 to make a positive difference to the lives of others and to the

 environment.

**Risk-takers** They approach unfamiliar situations and uncertainty with courage and

 forethought, and have the independence of spirit to explore new roles,

 ideas and strategies. They are brave and articulate in defending their

 beliefs.

**Balanced** They understand the importance of intellectual, physical and emotional

 balance to achieve personal well-being for themselves and others.

**Reflective** They give thoughtful consideration to their own learning and experience.

 They are able to assess and understand their strengths and limitations in

 order to support their learning and personal development.

**Course objectives and goals:**

During this course you will be expected to demonstrate your learning in each of the areas:

**Member of the scientific community**

* Each student will accept personal responsibility for learning and seek to learn from

and empower other members of the class.

* Each student will prepare for and participate in class activities.
* Each student (when necessary) will revise and work in response to feedback from

me and/or your classmates

**Systems and Models**

* Each student will be able to analyze processes, objects, and events in “systems”.
* Each student will be able to use models to communicate and clarify your

understanding.

**Scientific learning**

* Each student will engage in the creative process of experimental design and

analysis.

* Each student will be able to formulate investigable questions to advance your

understanding and carry out controlled experiments to address your questions.

* Each student will be able to use logic and evidence to form conclusions and

communicate these findings clearly.

**Science literacy and concepts**

* The single most important goal of this course is that each student attain a basic

 understanding of the natural word – that you attain science literacy.

* Science literacy is an understanding of the nature and processes science engages

in. Attaining scientific literacy in biology means that you seek to understand,

apply, and explain critical concepts as they pertain to the subject of biology.

**This is a laboratory based course that investigates major themes in biology including:**

Scientific Process, Molecules and Cells, Genetics and Evolution, Organisms and Populations,

Technology and Society

\* An overview of topics, aims and objectives is covered later in this handbook.

**Class Format**

Please understand that this is a college level course. Students enrolled in this course

should have successfully completed Living Environment. We will be working quite hard to fulfill all the course requirements. It will be important for you to remain attentive in class at all times. All work is to be turned in at designated times. I will “rarely” take late work. If I decide to do so, a possible grade penalty will be assigned. It is important, therefore to keep track of due dates for work assigned. Please see me immediately if you are having trouble in an area. We will work together to make sure you have a proper understanding.

**Class notes and your outlined notes** will be an integral part of this class. Be certain to keep all class notes, homework, etc, organized in your notebook. Remember, this is the material that you will be tested on in May of your senior year. Please keep your textbook covered with the contact paper. You will be using it for the full two years. Please do not mark in it unless you plan on purchasing it!

**Homework** will consist of readings, practice problems and essays, pre-labs and post-lab write ups, IB data analysis questions, special assignments, and other projects/assignments as seen fit. Whereas the required reading overall workload may appear challenging, it is manageable. Reading should be done before class so that you better follow the lectures and participate in class discussion. You also will be required to be responsible for all reading assignments and will be expected to develop note taking skills from what you have read. This is a very valuable skill that we will continue to develop and this skill will be necessary in future courses you will be challenged with.

**Technology requirements**: This course requires that all students utilize a computer to

conduct research and to produce various products outside of class time. Therefore all

students must have access to a computer and email account. (Do you know your username and password?) Since the public libraries and school library all have word processing software and internet access available, it is expected that all students without home computers make time in their schedules to frequent these libraries. There are also 5 computers available in room 317 for you to utilize during a free period. Please see me with any concerns!

**Textbooks**

You will have your textbook for 2 years so it is imperative that you cover and take exceptional care of your textbook!

**Required Materials/Supplies:**

* 2 large (3-4”) 3 hard ring binders (one for each year)
* 8 x 11 ½ Lined notebook paper (work may not be turned in o spiral or off size

notebook paper)

* dividers for your binder

suggestions for sections include:

* Syllabus/Course Handbook
* Notes
* Labs
* Hmwk
* Questions you have?
* Vocab
* Things to remember/reference
* Topics/Assessment Statements
* Miscellaneous

**Strongly recommended Supplies:**

* Thumb drive/flash driveto keep a copy of all files on. (should be available through Mr. Gardener if need be and let me know if we need to get you one. \* Lost/Deleted files will not be an acceptable excuse for missing/late assignments; it is to your benefit to have a travel drive so you can keep all your files in one place, and with you!
* 3 x 5 note cards with rubber band (2 packs is a good start)
* Note card box. You may quickly accumulate many index cards if that is how you choose to study. (A shoebox could work as well!)
* Colored Highlighters
* Calculator: TI- 84 plus is what we will use in class
* Small sticky notes/post its
* Gummed reinforcers (3 hole punch reinforcement stickers)

**Grade Policies and Expectations:**

“Learning is not attained by chance; it must be sought for with ardor (passion) and attended to with diligence.”

Abigail Adams

In my class, I will hold you, the student, to an academic standard considered by many to

be "high." I consider the academic standard appropriate. When it comes to getting the grade you desire, you have to meet **my standards for grades** and please be advised that I will hold you to high standards at all times. These guidelines will include both district guidelines and IB guidelines.

**Grades will be based on the following grading scale: (based on approximate point values per quarter)**

**Tests and announced Quizzes: ~ 50%**

**Laboratory Reports and Assignments associated with labs: ~ 25%**

**Homework, special assignments, pop quizzes: ~ 25%**

\*Please note that test make up the heaviest weighted area. This is in preparation for

the upcoming exams. Students should expect at least 1 test and or quiz a week

**Labs and Projects**

Lab and projects count for 25% of your class grade and 24% of your IB final mark. It

is imperative that you score as well as possible on the “internally assessed” work (labs,

projects). By doing well on this section you take some of the pressure of the final

IB/HL exam. This internally assessed work will be kept in a portfolio/lab folder that may be sent for IB moderation. This means my grade for your work will be examined to make sure it is in line with comparable students course work in biology from around the world.

This is a very important part of the course and should be taken very seriously. For

each lab or project you will know exactly what is expected of you. All you have to do is

fulfill those expectations. There is material concerning this internal assessment

included in this handbook you are receiving. I will give more information on this

subject as we proceed through the course.

**Homework and special assignments**

This category will help you prepare for your exams and will provide a bit of a cushion for

your test scores. Hopefully, you will receive a 100% each quarter in this category.

Students are expected to do their own work, including homework and lab reports.

When assigned, group lab reports are designed to encourage teamwork and flow of

ideas, not to have one student do all the work while the rest skate. Failure to

acknowledge sources is cheating. Failure to follow the GHS Academic Honesty Resource document will result in the consequences that are found in the Greenville Central School Code of Conduct. The IBO does not tolerate academic dishonesty and the consequences can be very severe in the case that credit can be lost by IBO.

**Grade Modifications**

Grades will only be modified if I agree there is a mistake on my part. If you feel you have

a claim, then make your case (before or after class or after school, not in class) and allow me to examine the situation. I am human and will make mistakes so feel free to address them in an appropriate manner.

**Extra Credit**

**There will not be any extra credit**. I believe your grade should reflect your effort

over the entire quarter. If you feel you will need extra credit to help your grade, then I

advise you to earn those points by working extra to score higher on tests and labs during

the quarter, rather than engaging in a scramble for "extra credit" at the end

of the quarter. Aren’t these points earned during the semester extra points for the

extra work needed to earn them? You will have plenty of opportunities to earn points

during the quarter. Please take advantage of them during the semester as opposed to

some frantic effort to replace them at the very last minute.

\*Note: Only on rare occasions will I offer bonus points to students, when and if offered

it will be offered to all students.

**Classroom Policies and expectations**

Class room rules and student responsibilities are a necessary part of any classroom. They

are designed to help you be a successful student. Some of the most important lessons

students learn in the course of growing up are the lessons of good work habits, how to be

organized, and how to be responsible for a task. Students who learn good work habits,

organizational skills and accept responsibility become successful students. Successful

students become successful people.

How classroom rules are implemented and followed establish the classroom culture for each class. It is my responsibility to ensure the rules are clearly stated, consistently enforced with fair and logical consequences to hold students accountable. It is each

student’s responsibility to carry out basic student responsibilities that minimize

disruptions to the learning environment and maximize learning.

**Classroom Rules are:**

1. **Be Responsible**: Be on time for class and come with all materials. This means,

 coming to class everyday with your materials, your assignments completed, working

 during work times, and following directions immediately.

2. **Be Respectful** of yourself and your peers keep your hands feet and objects to

 yourself. Students must show respect for the teacher, student, and school

 property. Be courteous to all and use acceptable language at all times.

3. FOLLOW ALL **LAB SAFTEY** RULES DURING LAB ACITIVITIES

4**.** Due to lab safety issues and the risk of contamination **NO FOOD OR DRINK**

 **WILL BE ALLOWED IN CLASS** excepted water

6. Students are not allowed in the back area without permission from me.

7. Students may not leave the room without clearance from me.

8. ABSOLUTELY NO CELL PHONES WILL BE TOLERATED!!!!!! (unless they are being utilized for research purposes)

**Student Roles and Responsibilities are:**

1. Attend class every day on time! Students should be sitting in their assigned seats

 when the bell rings, and remain in their seats till the released by instructor. Be

 aware that I will dismiss you, not the bell. We will **always** meet for the **entire** class

 period.

2. Think! Think about what you know and how it relates to what you’re learning.

3. Keep track of your assignments, notebook, and learning materials and bring them to

 class daily.

4. Listen to your peers and wait your turn to speak. Discussion, comments, and

 questions will be organized by raising your hand.

5. Read instructions and attempt work before asking for help.

6. Take responsibility for learning and practicing classroom routines

7. Take responsibility for grades and organizing your time and school work.

8. Every student is responsible for cleaning their lab area.

**Students are expected to:**

1. Read assigned material before coming to class.

2. Frequent, meaningful contributions to discussions and critical, respectful

 questioning approach.

3. Willingness to work with other students

4. Complete and thoughtful written assignments

5. An attitude that might be described as eager, confident, and cheerful.

**Consequences:**

So in summary, being unprepared, sleeping or having your head down on desk, inattention, reading magazines or novels, signaling to another, running anywhere to beat a tardy to my class, sitting other than in your assigned seat, cleaning out your notebook during class, throwing away trash during class, eating food in class, leaving trash around your seat or in sink, listening to yourCD,MP3, or IPOD player, letting me see your cell phone, using your cell phone in class (including texting), packing up early, grooming yourself, grooming another, looking at pictures, playing games on your graphing calculator or PSP or any other game console, logging onto inappropriate sites in the computer lab, etc. Is this a great list or what? I borrowed it from another teacher! Pretty much a list of silly stuff, but the above will get in the way of you (and others) doing our class work. If I determine that you consistently cannot make the correct behavioral choices, then I will take steps to convince you to make those choices. Students choosing not to meet the classroom expectations and policies may be warned, kept after class, kept after school, require a parent teacher conference, or referred to the appropriate administrator. **\*\*\*Please be advised students violating lab safety procedures may lose their lab privileges for the school year, which could lead to you failing the class.** You are expected to adhere to the student code of conduct of Greenville School, and class/lab management rules. Consequences for not adhering to the student code of conduct of Greenville School, and Class and Lab rules will be swift and immediate.

**These rules are easy to comply with and I do not anticipate having any problems; however, if**

**problems do arise then the following steps will be taken:**

1st Warning/Reminder

2nd Conference with Student after class and/or grade penalty

3rd Parent phone call, and/or grade penalty

4th Parent Conference with an administrator, and or grade penalty,

\* Severe Clause: should a discipline problem arise that requires immediate attention the above steps may be skipped.

**Academic Honesty**

1. Cheating is not gamesmanship; it is unethical.

2. Cheating may affect not only the individual but others as well, and hence, is more

 than the concern of one person.

3. In addition to verbal or written instructions concerning cheating, a student should

 implement common sense and rational judgment so as not to bring about any

 question of his/her integrity and honesty.

Description and Judgment of Cheating

* Studies (more than a glance) or provides advance acquaintance with questions or

 prohibited material

* Studies (more than a glance), reads, makes notes, copies, another students

 answer.

* Has test questions or prohibited material
* Uses material from a source not cited (plagiarism)

1. The teacher’s judgment is final. This does not mean that the teacher cannot

 change that judgment later, but that there is not debate about the behavior

2. The term “prohibited material” is defined by the teacher.

Failure to follow the GHS Academic Honesty Resource document will result in the consequences that are found in the Greenville Central School Code of Conduct. The IBO does not tolerate academic dishonesty and the consequences can be very severe in the case that credit can be lost by IBO.

Other Possible Consequences for Academic Dishonesty

1. No Credit (0) on the assignment

2. A referral/write up

3. Additional consequences at the discretion of the teacher such as losing lab partner

 privileges

4. Exclusion from honor groups such as National Honor Society

5. Possible difficulty obtaining teacher letters of recommendation for college

 application and/or scholarships.

**Late/Absentee/Missing Work:**

* **Late Homework/class work/labs is unacceptable**. Work is not accepted

late for any reason. It is due at the beginning of class. Not at the end of class/end

of day. I rarely accept late work (a legitimate excuse is required) and if I do it may be is with a substantial reduction in points.

* For excused absences all exams/quizzes and homework must be made up within the

same amount of days a student was absent for (or in a reasonable amount of time and must be done before or after school or during a free period.

* Students are responsible for getting notes/activities for any missed days. Missed assignments will be left in the designated folder for your class
* Due to the complexity of labs, a report may have to be done to supplement any

missed labs or arranged to be made up after school in a timely fashion. **Hint: DO NOT MISS LAB DAYS!!!**

* Assignments will be posted for the week on the board…So there

is no excuse for not keeping track of your assignments.

**Tardy Policy**:

In my class bell to bell learning/instruction is the expectation. Tardiness causes

interruptions in the flow of our learning. To help alleviate the disruptiveness of being

tardy, I have a simple policy that all students are expected to adhere to. **Grandiose**

**entrances are unacceptable.** When you are tardy, (for whatever reason) it is your goal and responsibility to quietly enter the room. When you enter the room drop your

pass (if you have one) on the front desk or hand to me. You then go to your seat, quietly

take out your materials and jump right in to the learning activity. Your “study buddy” will

update you at the appropriate time with the information you missed. I will at some point

during class examine your reason for being tardy and deal with it accordingly in private

conversation with you if necessary. I want to reinforce, that during my class time, I want you in my room, if you come in late, you are expected to make a quiet entrance and jump right in with the rest of class. If your tardy is a valid tardy, with the supporting evidence of a legitimate pass, your tardy will be excused. Otherwise after 3 lates you will receive a referral.

**Expectations and Guidelines for Success:**

“Every day you don't practice means you're a day farther from getting good. “

-- Ben Hogan

“Every worthwhile accomplishment has a price tag in terms of hard work, patience, faith, and endurance.”

Ted Engstrom

**Study, Study, Study, Learn, Learn, Learn**

I bet, down deep in your heart, where no one else goes, you already know this. The secret

to doing well in any area of study is to put in quality time, lots of it. The question is: Will

you actually do the work needed? Will you actually sit down and do the processes that you

need to do in order to master the material? Or will you minimize your work until the very

last moment? Will you work at a minimal level, but claim you're working "really, really

hard" and then start up the litany of "too hard" or "too much work" after a poor test

score? Or will you continue to work at enlightenment, even when you are so frustrated

you just want to burst? Are you able to go back and "do it again," unphased by past

struggles? Are you confident enough to never give up, knowing that success will come?

Helen Keller once said "We can do anything we want to, if we stick to it long enough." Do

you believe her? I do. It is important enough to me to emphasize the point: you can't

understand the material in this class (or any other class) until **YOU** do the work.

What I am telling you is that you have an important role to play in your education,

something you already know. Your education is not "inflicted" on your mind because I

"taught" you. You have to spend actual, precious time doing hard intellectual work. I want

you to give your education the full attention it deserves.

**“Study Buddies” What do you think?**

Success in our class room is dependent on a collaborative efforts made by each student.

Each student will be assigned (or may choose) a study buddy at the beginning of each quarter. Most likely your study buddy will be your lab partner(s). Your study buddy will be responsible for making sure you get the notes, activities, handouts, and homework in case of your absence. In turn you will do the same for your study buddy in the case of their absence. Study buddies will be required to exchange contact info and encouraged to study

together outside of class time. Your study buddy should be a source of encouragement

and reliability as you should also reciprocate the same characteristics. Study buddy/Lab

partner may be subject to change and do not hesitate to bring any issues to my attention.

**Study Clinics with Ms. Sharkey**

Whenever a student is not achieving academically in a course, he or she needs to know that help is available. If a student is having difficulty learning the materials presented in a course, it is usually due to one of the following factors:

a. The student is not using proper study techniques.

b. The student is not interested in the material.

c. The student is experiencing problems in his or her personal and/or home life.

All three of these factors demand that a student needs personalized attention. The Study clinic mini-course provides an opportunity to do so. Although the mini-course is designed to help a student who is not using proper study techniques, if there is a lack of student interest or personal problems are involved, I will attempt to address them in the text of the mini-course. The personalized attention given during the mini-course is often the catalyst for renewed student effort. Study clinics will be offered by appointment and depend on availability.

**Study clinics are encouraged for students who:**

a. Scored poorly on a quiz and/or project.

b. Would like to go over a concept they are confused about or a “little shaky” on the details of.

c. Study better with a study group/partner and need a place to study after school.

**All students should plan to attend at least 2 study clinics a year to perform a “Problem Diagnosis and Remedy” workshop.** When students attend a study clinic they will receive a copy of the “Initial Problem and Diagnosis and Remedy” (Fleming 2002) that describes the process of the diagnosis and remedy for exams/quizzes.

**Study Clinic Hours**

**Study clinics are held in rm. 317 from 3-4 pm by appointment or when otherwise arranged**

 (Students do not have to stay the time if it is not necessary)

\*\*\*Study Clinic Hours are tentative and may change or be postpone in the event of teacher meetings, illness, or other situations that call for me to leave campus.

\*\*\* Study Clinics has been adapted from Biology Teachers Survival Guide by

Michael F. Fleming © John Wiley and Sons, Inc 2002.

HL IB Biology program in more detail

**IB Aims**

Through studying any of the group 4 subjects, students should become aware of how

scientists work and communicate with each other. While the “scientific method” may take

on a wide variety of forms, it is the emphasis on a practical approach through

experimental work that distinguishes the group 4 subjects from other disciplines and

characterizes each of the subjects within group 4.

It is in this context that all the Diploma Programme experimental science courses should

aim to:

1. provide opportunities for scientific study and creativity within a global

 context that will stimulate and challenge students

2. provide a body of knowledge, methods and techniques that characterize

 science and technology

3. enable students to apply and use a body of knowledge, methods and

 techniques that characterize science and technology

4. develop an ability to analyse, evaluate and synthesize scientific information

5. engender an awareness of the need for, and the value of, effective

 collaboration and communication during scientific activities

6. develop experimental and investigative scientific skills

7. develop and apply the students’ information and communication

 technology skills in the study of science

8. raise awareness of the moral, ethical, social, economic and

 environmental implications of using science and technology

9. develop an appreciation of the possibilities and limitations associated

 with science and scientists

10. encourage an understanding of the relationships between scientific

 disciplines and the overarching nature of the scientific method.

**IB Objectives**

The objectives for all group 4 subjects reflect those parts of the aims that will be

assessed. Wherever appropriate, the assessment will draw upon environmental and

technological contexts and identify the social, moral and economic effects of science.

It is the intention of all the Diploma Programme experimental science courses that

students achieve the following objectives.

1. Demonstrate an understanding of:

 a. scientific facts and concepts

 b. scientific methods and techniques

 c. scientific terminology

d. methods of presenting scientific information.

2. Apply and use:

a. scientific facts and concepts

b. scientific methods and techniques

c. scientific terminology to communicate effectively

d. appropriate methods to present scientific information.

3. Construct, analyse and evaluate:

a. hypotheses, research questions and predictions

b. scientific methods and techniques

c. scientific explanations.

4. Demonstrate the personal skills of cooperation, perseverance and

 responsibility appropriate for effective scientific investigation and

 problem solving.

5. Demonstrate the manipulative skills necessary to carry out scientific

 investigations with precision and safety.

**IB Biology Command Terms**

These command terms indicate the depth of treatment required for a given assessment

statement. These command terms will be use in examination questions, so it is important that you

are familiar with the following definitions.

**Objective 1**

**Define:** Give the precise meaning of the word, phrase or physical quality.

**Draw:** Represent by means of pencil lines (always label unless told NOT to do so).

**Label:** Add labels to a diagram.

**List:** Give a sequence of names or other brief answers with NO explanation.

**Measure:** Find a value for a quantity.

**State:** Give a specific name, value or other brief answer without explanation or

 calculation.

**Objective 2**

**Annotate:** Add brief notes to the diagram or graph.

**Apply:** Use an idea, equation, principle, theory or law in a new situation

**Calculate:** Find a numerical answer showing the relevant stages in the working (unless

 instructed not to do so).

**Describe:** Give a detailed account.

**Distinguish:** Give the differences between two or more different items.

**Estimate:** Find an approximate value for an unknown quantity.

**Identify:** Find an answer from a given number of possibilities.

**Outline:** Give a brief account or summary

**Objective 3**

**Analyze:** Interpret data to reach conclusions.

**Comment:** Give a judgment based on a given statement or result of a calculation.

**Compare:** Give an account of similarities and differences between two (or more) items,

 referring to both (all) of them throughout.

**Construct:** Represent or develop in graphical form.

**Deduce:** Reach a conclusion from the information given.

**Derive:** Manipulate a mathematical relationship(s) to give a new equation or relationship.

**Design:** Produce a plan, simulation or model.

**Determine:** Find the only possible answer.

**Discuss:** Give an account including, where possible, a range of arguments for and against

 the relative importance of various factors, or comparisons of alternative

 hypotheses.

**Evaluate:** Assess the implications and limitations.

**Explain:** Give a detailed account of causes, reasons or mechanisms.

**Predict:** Give an expected result.

**Show:** Give the steps in a calculation or derivation.

**Sketch:** Represent by means of a graph showing a line and labelled but unscaled axes,

 but with important features (for example, intercept) clearly indicated.

**Solve:** Obtain an answer using algebraic and/or numerical methods.

**Suggest:** Propose a hypothesis or other possible answer.

**External Assessment**

This is completed by examination in May 2012. You will sit three papers, all of which will

be marked by an examiner who has never met you and knows nothing about you.

**External assessment counts towards 76% of your final marks – so be prepared!**

**HL assessment specifications**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Overall****weighting****(%)** | **Approximate****weighting of****objectives (%)****1&2 3** | **Duration****(hours)** | **Format and syllabus coverage** |
| **Paper 1** | **20** |  **20** | **1** | 40 multiple-choice questions (±15 common to SL plus about five more on the core and about 20 more on the AHL) |
| **Paper 2** | **36** | **18 18** | **2 ¼** | Section A: one data-based question and several short answer questions on the core and the AHL (all compulsory)Section B: two extended-response questions on thecore and the AHL (from a choice of four) |
| **Paper 3** | **20** | **10 10** | **1 ¼** | Several short-answer questions and one extended response question in each of the two options studied(all compulsory) |

Paper 1 is made up of multiple-choice questions that test knowledge of the core and AHL material. The questions are designed to be short, one- or two-stage problems that address objectives 1 and 2 (see the “Objectives” section). No marks are deducted for incorrect responses. Calculators are not permitted, but students are expected to carry out simple calculations.

Paper 2 tests knowledge of the core and AHL material. The questions address objectives 1, 2 and 3 and the paper is divided into two sections. In section A, there is a data-based question that requires students to analyse a given set of data. The remainder of section A is made up of short-answer questions. In section B, students are required to answer two questions from a choice of four. These extended-response questions may involve writing a number of paragraphs, solving a substantial problem, or carrying out a substantial piece of analysis or evaluation. A calculator is required for this paper.

Paper 3 tests knowledge of the options and addresses objectives 1, 2 and 3. Students are required to answer several short-answer questions and an extended-response question in each of the two options studied. A calculator is required for this paper.

**Internal Assessment**

This is the practical component of your course, and is marked by your teachers. However, at the end of the course, we are expected to send off a sample of your work (randomly chosen by the IBO) to be moderated. This means that you have to do your best to satisfy the criteria in your assessments if you want to get the best possible marks! Over the next few pages, you will see more details on exactly how to get top marks in each criteria. There is also a step-by-step guide to writing a good practical report, and if you follow this, you will increase your chances of success. Later in the year, we will have the Group 4 Project, a collaborative Science project which will test your competence in all of the IA assessment criteria. You will receive a special Group 4 guide when the time comes.

**Internal assessment counts towards 24% of your final marks!**

**Criteria and aspects**

There are five assessment criteria that are used to assess the 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 shouldbe 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%.

**Internal Assessment Rubric**

**Design**

|  |  |  |  |
| --- | --- | --- | --- |
| **Levels/marks** | **Aspect 1****Defining the problem and****selecting variables** | **Aspect 2****Controlling variables** | **Aspect 3****Developing a method for****collection of data** |
| **Complete/2** | Formulates a focusedproblem/research question andidentifies the relevantvariables. | Designs a method for theeffective control of thevariables. | Develops a method that allowsfor the collection of sufficientrelevant data. |
| **Partial/1** | Formulates a problem/researchquestion that is incomplete **or**identifies only some relevantvariables. | Designs a method that makessome attempt to control thevariables. | Develops a method that allowsfor the collection ofinsufficient relevant data. |
| **Not at all/0** | Does not identify aproblem/research question **and**does not identify any relevantvariables. | Designs a method that does notcontrol the variables. | Develops a method that doesnot allow for any relevant datato be collected. |

**Data collection and processing**

|  |  |  |  |
| --- | --- | --- | --- |
| **Levels/marks** | **Aspect 1****Recording raw data** | **Aspect 2****Processing raw data** | **Aspect 3****Presenting processed data** |
| **Complete/2** | Records appropriatequantitative and associatedqualitative raw data, includingunits and uncertainties whererelevant. | Processes the quantitative rawdata correctly. | Presents processed dataappropriately and, whererelevant, includes errors anduncertainties. |
| **Partial/1** | Records appropriatequantitative and associatedqualitative raw data, but withsome mistakes or omissions. | Processes quantitative rawdata, but with some mistakesand/or omissions. | Presents processed dataappropriately, but with somemistakes and/or omissions. |
| **Not at all/0** | Does not record anyappropriate quantitative rawdata **or** raw data isincomprehensible. | No processing of quantitative raw data is carried out **or** major mistakes are made inprocessing. | Presents processed datainappropriately **or**incomprehensibly. |

**Conclusion and evaluation**

|  |  |  |  |
| --- | --- | --- | --- |
| **Levels/marks** | **Aspect 1****Concluding** | **Aspect 2****Evaluating procedure(s)** | **Aspect 3****Improving the investigation** |
| **Complete/2** | States a conclusion, withjustification, based on areasonable interpretation ofthe data. | Evaluates weaknesses andlimitations. | Suggests realisticimprovements in respect ofidentified weaknesses andlimitations. |
| **Partial/1** | States a conclusion based on areasonable interpretation ofthe data. | Identifies some weaknessesand limitations, but theevaluation is weak or missing. | Suggests only superficialimprovements. |
| **Not at all/0** | States no conclusion **or** theconclusion is based on anunreasonable interpretation ofthe data. | Identifies irrelevantweaknesses and limitations. | Suggests unrealisticimprovements. |

**Manipulative skills (assessed summatively)**

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

\*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.

**IB Biology Internal Assessment Lab Format**

The following titles and subtitles should be used for your lab report and given in this

order within your lab report.

**Design**

**Question -** must be focused and not ambiguous in any way

**Hypothesis** – state first & then give a logical rationale – your conclusion should address the hypothesis you are giving here

**Variables** – chart or list identifying Independent, Dependent, & Controlled

Variables

**Protocol Diagram** – draw & label a diagram which best shows the major protocol(s) you used. Often this will focus on the technique that was used to measure the dependent variable and/or the technique that was used to ‘setup’ different increments of the independent variable. Make sure to show how control group(s) differ from experimental group(s). This is also where I want you to emphasize the inclusion of a period of time for ‘equilibration’ of equipment, fluids, organisms, etc. The inclusion of time periods for equilibration should also be included in your written procedure.

**Photograph of Lab Setup** – annotate this to show how **variables** were

 instituted, especially the controlled variables. Do not just label equipment.

**Procedure** – write in paragraph form, passive voice, and past tense

**Data Collection and Processing**

**Raw Data Table** – make sure this is raw data only. Data table design & clarity is

important. A title should be given (Raw Data Table is not a data table title, it is a lab report section title) Make sure that all columns, etc. are properly headed & units are given. Forgetting one unit or misidentifying one unit is enough to drop your score in this section. Do not “split” a data table (putting part of a table on one page and finishing it on another). If you absolutely have to split a table (d ue to quantity of data), make sure that you re-do the title and all column headings. Uncertainties are mandatory and can be given within column headings for equipment precision and as footnotes beneath data tables for other types of uncertainties.

**Data Processing**

**Overview** – this is a short paragraph section that gives an overview of how and

why you decided to process and present the data in the form that shows up later in

this section.

**Sample Calculation** – neatly lay out and explain one example only of any type of

manipulation that was done to the raw data to help make it more useful for

interpretation.

**Presentation** – this is typically one or more data tables (of your now processed

data) and one or more graphs of this processed data. Once again, the design &

clarity of data table(s) is important and the quality of graphs is also very

important. Give careful consideration to the choice of graph style(s) that you

choose to do. Think about doing a scatter plot or perhaps a line graph showing error

bars or any number of other creative graphing styles rather than just a simple line

graph. Remember that demonstrating errors and uncertainties in your data is also

mandatory for the processed data. Make sure that you follow good standard rules

for doing graphs (valid title, axis’ labeled including units, etc.) Note: Weak experimental design can sometimes limit you to pie graphs and/or bar graphs; avoid this by good experimental design in which you have a quantitative independent variable (with well chosen incremental values) as well as a quantitative

dependent variable.

**Conclusion & Evaluation**

**Conclusion** - this is a paragraph section in which you get a chance to discuss the results of your experiment. Start by addressing whether your data seems to support or refute your hypothesis. This should be discussed and not just stated. Specifically refer to your graphs to give support to this discussion. Avoid the use of the word “proof”or “proves”within your conclusion, as your data will not prove anything.

**Limitations of Experimental Design** – this paragraph section discusses how well your experimental design helped answer your experimental question. What worked well (and why) and what did not work well (and why). This is also a section in which outlier points could be discussed (if there were any outlier points) as well as possible reasons for those outlier points. If you did any statistical tests, what did the results of that test show? If you have error bars on your graph(s) what do those show?

**Suggestions for Improvement** - In reference to the limitations given in the previous subsection, what realistic and useful improvements could be made if you were to do this investigation again?

Refer to the Internal Assessment Grading Matrix given to you earlier for a complete

picture of how you are evaluated on each of the three criteria:

* Design
* Data Collection and Processing
* Conclusion and Evaluation

**IA Lab Check list**

**Checklist for design**

Aspect 1: defining the problem and selecting variables

* I have identified a focused problem or a specific research question. I have done this by, for example, stating a clear aim, a clear hypothesis, and clearly defining the variables.
* I have identified and stated the independent variable and the dependent variable, and I have listed the controlled variables

Aspect 2: controlling variables

* I describe a method for the effective control of the variables. In particular, I describe how the independent variable is manipulated and how the controlled variables are maintained at constant values
* I list all the apparatus and materials used, including the volumes of tubes and cylinders, the concentrations of solutions, the model and manufacturer of any complex apparatus,etc.
* I state the level of precision of the values for the independent variable
* Any standard methods that I use are fully referenced in a footnote

Aspect 3: developing a method for the collection of data

* I describe a method that allows for the collection of sufficient relevant data
* The data gathered enables the aim, the research question or the hypotheses to be

adequately addressed

* The data gathered enables an evaluation of the reliability of the data
* The sample size should be adequate to allow a reasonable statistical analysis of the data (for calculating the standard deviation, at least five items per treatment)
* An adequately broad data range is considered
* An adequate number of data values within this range are considered

**Checklist for data collection and processing**

Aspect 1: recording raw data

* I have recorded my data independently
* I have data which is quantitative (numerical)
* I have chosen a suitable format in which to record the raw data
* The variable that is measured or recorded is clearly stated (e.g. in the column heading in a table)
* The units are given for every variable (e.g. in any column headings)
* An indication is given of the uncertainty of measurements (e.g. in any column headings)
* A complete and descriptive title is given to any table that is used
* The same level of precision (number of decimal places) is used for all the items of a

variable

Aspect 2: processing raw data

* I have decided on a suitable manner in which to process the raw data, so that I may fully test the hypotheses or fulfill the aim (this may involve a mathematical processing, statistical analysis, or transforming the data into a suitable graphical representation)
* All of the raw data has been processed to a suitable extent
* The raw data has been processed correctly
* Any raw data plotted onto a graph includes a line of best-fit

Aspect 3: presenting processed data

* I have decided upon a suitable format in which to present the processed data.
* There are clear, unambiguous headings for calculations, tables or graphs
* Any graphs have appropriate scales, labeled axes with units and accurately plotted data points with a suitable best-fit line or curve
* The data has been presented so that all the stages to the final result can be followed
* Metric/SI units are included for the final results
* The final results are shown expressed to the correct number of significant figures
* The uncertainties and errors associated with the raw data have been taken into account and this is shown in some manner (e.g. error bars may be used, as appropriate)

**Checklist for conclusion and evaluation**

Aspect 1: concluding

* I state a conclusion which is based on a reasonable interpretation of the data
* If any hypotheses are being tested, I have stated whether the data supports these

hypotheses

* I give a justification for my conclusion
* As appropriate, I compare different graphs, or describe the trends shown in my graphs
* If I am measuring an already known and accepted value, I have compared my value with that in a textbook, in order to assess the validity of the result.
* I fully reference any literature that is quoted.

Aspect 2: evaluating procedures

* I have commented on the design and method of the investigation
* I have commented on the quality of the data
* I have listed the weaknesses of the study
* I have assessed the importance of each of these weaknesses
* I have commented on the precision and accuracy of the measurements
* In evaluating the procedure, I have specifically looked at the processes, the use of

equipment and the management of time

Aspect 3: improving the investigation

* My suggestions for improvements are based on the weaknesses and limitations identified in aspect 2
* As appropriate, I address modifications to the experimental technique and the data range
* The modifications that I propose are realistic and clearly specified

**Checklist for manipulative skills**

Aspect 1: following instructions

* I follow instructions accurately, adapting to new circumstances. I mostly work

independently, reading the instructions carefully, but seek assistance when

required

Aspect 2: carrying out techniques

* I am competent and methodical in the use of a range of techniques and equipment

Aspect 3: working safely

* I pay attention to safety issues

**Summary of the group 4 project**

The group 4 project is a collaborative activity where students from different group 4

subjects work together on a scientific or technological topic, allowing for concepts and

perceptions from across the disciplines to be shared in line with aim 10—that is, to

“encourage an understanding of the relationships between scientific disciplines and the

overarching nature of the scientific method”. The project can be practically or

theoretically based. Collaboration between schools in different regions is encouraged.

The group 4 project allows students to appreciate the environmental, social and ethical

implications of science and technology. It may also allow them to understand the

limitations of scientific study, for example, the shortage of appropriate data and/or the

lack of resources. The emphasis is on interdisciplinary cooperation and the processes

involved in scientific investigation, rather than the products of such investigation.

The choice of scientific or technological topic is open but the project should clearly address aims 7, 8 and 10 of the group 4 subject guides.

Ideally, the project should involve students collaborating with those from other group 4 subjects at all stages. To this end, it is not necessary for the topic chosen to have clearly identifiable separate subject components. However, for logistical reasons some schools may prefer a separate subject “action” phase (see the following “Project stages” section).

**Project stages**

The 10 hours allocated to the group 4 project, which are part of the teaching time set

aside for IA, can be divided into three stages: planning, action and evaluation.

**Planning**

This stage is crucial to the whole exercise and should last about two hours.

* The planning stage could consist of a single session, or two or three shorter ones.
* This stage must involve all group 4 students meeting to “brainstorm” and discuss

the central topic, sharing ideas and information.

* The topic can be chosen by the students themselves or selected by the teachers.
* Where large numbers of students are involved, it may be advisable to have more

than one mixed subject group.

**After selecting a topic or issue, the activities to be carried out must be clearly**

**defined before moving from the planning stage to the action and evaluation stages.**

**Action**

This stage should last around six hours and may be carried out over one or two weeks in

normal scheduled class time. Alternatively, a whole day could be set aside if, for example,

the project involves fieldwork.

* Students should investigate the topic in mixed subject groups or single subject

groups.

* There should be collaboration during the action stage; findings of investigations

should be shared with other students within the mixed/single subject group.

During this stage, in any practically based activity, it is important to pay

attention to safety, ethical and environmental considerations.

**Evaluation**

The emphasis during this stage, for which two hours is probably necessary, is on students

sharing their findings, both successes and failures, with other students. How this is

achieved can be decided by the teachers, the students or jointly.

* One solution is to devote a morning, afternoon or evening to a symposium where all

the students, as individuals or as groups, give brief presentations.

* Alternatively, the presentation could be more informal and take the form of a

science fair where students circulate around displays summarizing the activities of

each group.

The symposium or science fair could also be attended by parents, members of the school

board and the press. This would be especially pertinent if some issue of local importance

has been researched. Some of the findings might influence the way the school interacts

with its environment or local community.

**Types of project**

While addressing aims 7, 8 and 10 the project must be based on science or its

applications.

The project may have a hands-on practical action phase or one involving purely theoretical

aspects. It could be undertaken in a wide range of ways.

* Designing and carrying out a laboratory investigation or fieldwork.
* Carrying out a comparative study (experimental or otherwise) in collaboration with

another school.

* Collating, manipulating and analysing data from other sources, such as scientific

journals, environmental organizations, science and technology industries and

government reports.

* Designing and using a model or simulation.
* Contributing to a long-term project organized by the school

\***Specific Details on Group Projects will be given out in class**

**Syllabus overview**

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The syllabus for the Diploma Programme biology course is divided into three parts: the core, the AHL material and the options. A syllabus overview is provided below.

**Teaching hours**

**Core 80**

Topic 1: Statistical analysis 2

Topic 2: Cells 12

Topic 3: The chemistry of life 15

Topic 4: Genetics 15

Topic 5: Ecology and evolution 16

Topic 6: Human health and physiology 20

**AHL 55**

Topic 7: Nucleic acids and proteins 11

Topic 8: Cell respiration and photosynthesis 10

Topic 9: Plant science 11

Topic 10: Genetics 6

Topic 11: Human health and physiology 17

**Options 15/22**

**Options SL**

Option A: Human nutrition and health 15

Option B: Physiology of exercise 15

Option C: Cells and energy 15

**Options SL and HL**

Option D: Evolution 15/22

Option E: Neurobiology and behaviour 15/22

Option F: Microbes and biotechnology 15/22

Option G: Ecology and conservation 15/22

**Options HL**

Option H: Further human physiology 22

Students at SL are required to study any **two** options from A–G.

The duration of each option is 15 hours.

Students at HL are required to study any **two** options from D–H.

The duration of each option is 22 hours.

**Mathematical Requirements**

All Diploma Program biology students should be able to:

* perform the basic arithmetic functions: addition, subtraction, multiplication and division
* recognize basic geometric shapes
* carry out simple calculations within a biological context involving decimals, fractions, percentages,
* ratios, approximations, reciprocals and scaling
* use standard notation (for example, 3.6 × 10^6)
* use direct and inverse proportion
* represent and interpret frequency data in the form of bar charts, column graphs and histograms, and
* interpret pie charts and nomograms
* determine the mode and median of a set of data
* plot and interpret graphs (with suitable scales and axes) involving two variables that show linear or
* non-linear relationships
* plot and interpret scattergraphs to identify a correlation between two variables, and appreciate that
* the existence of a correlation does not establish a causal relationship
* demonstrate sufficient knowledge of probability to understand how Mendelian ratios arise and to
* calculate such ratios using a Punnett grid
* make approximations of numerical expressions
* recognize and use the relationships between length, surface area and volume.

**Class Resources**

Textbook:

Damon, McGonegal, Tosto, and Ward, **Heinemann Diploma: Biology Higher Level**

newest edition

Supplemental Text:

Campbell & Reece, **Biology**, AP Edition, 7th Edition

Campbell, Reece, Taylor, and Simon, **Biology: Concepts and Connections**, 5th Edition

Allott and Mindorff, **IB Diploma Course Companion: Biology**

IB Question Bank-Biology. http//store.IBO.org

**Biology 1 and 2 by Biozone**

**Communication**

Teacher Contact Info:

Greenville High School # : 966-5070

Ms. Sharkey Email address: sharkeye@greenville.k12.ny.us

**Class websites:**

We will have a running list that we will share and add to as we progress

www.click4biology.com

**Aknowledgements:**

I’ve read lots of books, talked with fellow educators, had many enlightening

conversations with my students, and visited many educator websites to get ideas to

help build my classroom culture and foundation. Below I have attempted to cite

sources where I have found useful techniques and/or information pertinent to

classroom logistics, management, and organization used in my classroom.

Duval County Public Schools Science Curriculum/Department

Michael F. Fleming - Biology Teachers survival guide

Ms. Thomas’ Biology course

Mr. Steven Taylor’s Biology course

[www.ibo.org](http://www.ibo.org)

[www.biologyforlife.com](http://www.biologyforlife.com)