**Higher Level Biology – Class Handbook**

**Greenville High School**

**International Baccalaureate Program**

****

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**IB Mission Statement:**

**The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect. To this end the organization works with schools, governments and international organizations to develop challenging programs of international education and rigorous assessment. These programs encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.**

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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.

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 with a focus on the Nature of Science:**

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 binder. 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: ~ 40%**

**Laboratory Reports and Assignments associated with labs: ~ 30%**

**Homework, special assignments, pop quizzes: ~ 30%**

\*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 30% of your class grade and 20% 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. 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** except 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 seats

 when the bell rings, and remain in their seats till 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. Frequently make meaningful contributions to discussions and to think critically.

 Remember to always use a respectful questioning approach.

3. Display a willingness to work with other students

4. Complete and thoughtful complete written assignments

5. Come to class with 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 be 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

3rd Parent phone call

4th Parent Conference with an administrator

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

**Academic Honesty**

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.

As cited in the IB Biology Guide, “Academic honesty in the Diploma Programme is a set of values and behaviours informed by the attributes of the learner profile. In teaching, learning and assessment, academic honesty serves to promote personal integrity, engender respect for the integrity of others and their work, and ensure that all students have an

equal opportunity to demonstrate the knowledge and skills they acquire during their studies. All coursework—including work submitted for assessment—is to be authentic, based on the student’s individual and original ideas with the ideas and work of others fully acknowledged. Assessment tasks that require teachers to provide guidance to students or that require students to work collaboratively must be completed in full compliance with the detailed guidelines provided by the IB for the relevant subjects. For further information on academic honesty in the IB and the Diploma Programme, please consult the IB publications *Academic honesty, The Diploma Programme: From principles into practice and General regulations: Diploma Programme*. Specific information regarding academic honesty as it pertains to external and internal assessment components of this Diploma Programme subject can be found in this guide.”

**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, 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 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.

**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

**Group 4 Aims**

Through studying biology, chemistry or physics, 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 characterizes these subjects.

The aims enable students, through the overarching theme of the Nature of science, to:

1. appreciate scientific study and creativity within a global context through stimulating and

 challenging opportunities

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

 technology

3. 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. develop a critical awareness of the need for, and the value of, effective collaboration

 and communication during scientific activities

6. develop experimental and investigative scientific skills including the use of current

 technologies

7. develop and apply 21st century communication skills in the study of science

8. become critically aware, as global citizens, of the ethical implications of using science

 and technology

9. develop an appreciation of the possibilities and limitations of science and technology

10. develop an understanding of the relationships between scientific disciplines and their

 influence on other areas of knowledge.

**IB Assessment Objectives**

The assessment objectives for biology, chemistry and physics reflect those parts of the aims that will be formally assessed either internally or externally. These assessments will centre upon the nature of science. It is the intention of these courses that students are able to fulfill the following assessment objectives:

1. Demonstrate knowledge and understanding of:

a. facts, concepts and terminology

b. methodologies and techniques

c. communicating scientific information.

2. Apply:

a. facts, concepts and terminology

b. methodologies and techniques

c. methods of communicating scientific information.

3. Formulate, analyse and evaluate:

a. hypotheses, research questions and predictions

b. methodologies and techniques

c. primary and secondary data

d. scientific explanations.

4. Demonstrate the appropriate research, experimental, and personal skills necessary to carry out insightful and ethical investigations.

**IB Biology Command Terms**

Students should be familiar with the following key terms and phrases used in examination questions. Although these terms will be used frequently in examination questions, other terms may be used to direct students to present an argument in a specific way.

These command terms indicate the depth of treatment required.

**Objective 1**

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

**Draw:** Represent by means of a labelled, accurate diagram or graph, using a pencil. A ruler

(straight edge) should be used for straight lines. Diagrams should be drawn to scale.

Graphs should have points correctly plotted (if appropriate) and joined in a straight

line or smooth curve.

**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.

**Calculate:** Obtain 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 concepts or items.

**Estimate:** Obtain an approximate value

**Identify:** Provide an answer from a number of possibilities.

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

**Objective 3**

**Analys(z)e:** Break down in order to bring out the essential elements or structure

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

**Compare:** Give an account of similarities between two (or more) items or situations, referring to

 both (all) of them throughout

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

 items or situations, referring to both (all) of them throughout.

**Construct:** Display information in a diagrammatic or logical form

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

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

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

**Discuss:** Offer a considered and balanced review that includes a range of arguments, factors or

hypotheses. Opinions or conclusions should be presented clearly and supported by

appropriate evidence.

**Evaluate:** Make an appraisal by weighing up the strengths and limitations.

**Explain:** Give a detailed account including reasons or causes.

**Predict:** Give an expected result.

**Sketch:** Represent by means of a diagram or graph (labelled as appropriate). The sketch should

give a general idea of the required shape or relationship, and should include relevant

features

**Suggest:** Propose a solution, hypothesis or other possible answer

**Assessment outline:**

This is completed by examination in May 2016.

**HL assessment specifications**

|  |  |  |  |
| --- | --- | --- | --- |
| **Component** | **Overall****weighting****(%)** | **Approximate****weighting of****objectives (%)****1 & 2 3** | **Duration****(hours)** |
| **Paper 1** | **20** |  **10 10** | **1** |
| **Paper 2** | **36** |  **18 18** | **2 ¼** |
| **Paper 3** | **24** |  **10 10** | **1 ¼** |
| **Internal Assessment** | **20** | **Covers objectives 1,2,3 and 4** | **10** |

**External assessment details—HL**

**Paper 1**

Duration: 1 hour

Weighting: 20% Marks: 40

• 40 multiple-choice questions on core and AHL material, about 15 of which are common with SL.

• The questions on paper 1 test assessment objectives 1, 2 and 3.

• The use of calculators is not permitted.

• No marks are deducted for incorrect answers.

**Paper 2**

Duration: 2¼ hours

Weighting: 36% Marks: 72

• Data-based question.

• Short-answer and extended-response questions on core and AHL material.

• Two out of three extended response questions to be attempted by candidates.

• The questions on paper 2 test assessment objectives 1, 2 and 3.

• The use of calculators is permitted. (See calculator section on the OCC.)

**Paper 3**

Duration: 1¼ hours

Weighting: 24% Marks: 45

• Section A: candidates answer all questions, two to three short-answer questions based on experimental skills and techniques, analysis and evaluation, using unseen data linked to the core and AHL material.

• Section B: short-answer and extended-response questions from one option.

• The questions on paper 3 test assessment objectives 1, 2 and 3.

• The use of calculators is permitted. (See calculator section on the OCC.)

**Internal Assessment**

Internal assessment component

Duration: 10 hours

Weighting: 20%

• Individual investigation.

• This investigation covers assessment objectives 1, 2, 3 and 4.

Internal assessment criteria

The new assessment model uses five criteria to assess the final report of the individual investigation with the following raw marks and weightings assigned:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Personalengagement | Exploration | Analysis | Evaluation | Communication | Total |
| 2 (8%) | 6 (25%) | 6 (25%) | 6 (25%) | 4 (17%) | 24 (100%) |

Levels of performance are described using multiple indicators per level. In many cases the indicators occur together in a specific level, but not always. Also, not all indicators are always present. This means that a candidate can demonstrate performances that fit into different levels. To accommodate this, the IB assessment models use markbands and advise examiners and teachers to use a best-fit approach in deciding the appropriate mark for a particular criterion.

Teachers should read the guidance on using markbands shown above in the section called “Using assessment criteria for internal assessment” before starting to mark. It is also essential to be fully acquainted with the marking of the exemplars in the teacher support material. The precise meaning of the command terms used in the criteria can be found in the glossary of the subject guides.

 **Personal engagement**

This criterion assesses the extent to which the student engages with the exploration and makes it their own.

Personal engagement may be recognized in different attributes and skills. These could include addressing personal interests or showing evidence of independent thinking, creativity or initiative in the designing, implementation or presentation of the investigation.

|  |  |
| --- | --- |
| Mark | Descriptor |
| 0 | The student’s report does not reach a standard described by the descriptors below. |
| 1 | **The evidence of personal engagement with the exploration is limited with little** **independent thinking, initiative or creativity (insight).**The justification given for choosing the research question and/or the topic under investigation does not demonstrate **personal significance, interest or curiosity**.There is little evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation. |
| 2 | **The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or creativity (insight).**The justification given for choosing the research question and/or the topic under investigation demonstrates **personal significance, interest or curiosity**.There is evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation |

**Exploration**

This criterion assesses the extent to which the student establishes the scientific context for the work, states a clear and focused research question and uses concepts and techniques appropriate to the Diploma Programme level. Where appropriate, this criterion also assesses awareness of safety, environmental, and ethical considerations.

|  |  |
| --- | --- |
| **Mark** | **Descriptor** |
| 0 | The student’s report does not reach a standard described by the descriptors below |
| 1-2 | The topic of the investigation is identified and a research question of some relevance is **stated but it is not focused.**The background information provided for the investigation is **superficial** or of limited relevance and does not aid the understanding of the context of the investigation.The methodology of the investigation is only appropriate to address the research question to a very limited extent since it takes into consideration few of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.The report shows evidence of limited awareness of the significant safety, ethical or environmental issues that are **relevant to the methodology of the investigation**\*. |
| 3-4 | The topic of the investigation is identified and a relevant but not fully focused research question is described.The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.The methodology of the investigation is mainly appropriate to address the research question but has limitations since it takes into consideration only some of the significant factors that may influence the relevance, reliability and sufficiency of the collected data. The report shows evidence of some awareness of the significant **safety**, ethical or environmental issues that are **relevant to the methodology of the investigation**\*. |
| 5-6 | The topic of the investigation is identified and a relevant and fully focused research question is clearly described.The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation. The methodology of the investigation is highly appropriate to address the research question because it takes into consideration all, or nearly all, of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.The report shows evidence of full awareness of the significant **safety**, ethical or environmental issues that are **relevant to the methodology of the investigation\*** |

\* This indicator should only be applied when appropriate to the investigation. See exemplars in TSM.

**Analysis**

This criterion assesses the extent to which the student’s report provides evidence that the student has selected, recorded, processed and interpreted the data in ways that are relevant to the research question and can support a conclusion.

|  |  |
| --- | --- |
| Mark | Descriptor |
| 0 | The student’s report does not reach a standard described by the descriptors below |
| 1-2 | The report includes **insufficient relevant** raw data to support a valid conclusion to the research question.Some **basic** data processing is carried out but is either too **inaccurate or too insufficient to lead to a valid** conclusion.The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.The processed data is incorrectly or insufficiently interpreted so that the conclusion is invalid or very incomplete |
| 3-4 | The report includes relevant but incomplete quantitative and qualitative raw data that could support a simple or partially valid conclusion to the research question.Appropriate and sufficient data processing is carried out that could lead to a broadly valid conclusion but there are significant inaccuracies and inconsistencies in the processing.The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis.The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced |
| 5-6 | The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.Appropriate and sufficient data processing is carried out with **the accuracy** required to enable a conclusion to the research question to be drawn that is fully **consistent** with the experimental data.The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis.The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced. |

Evaluation

This criterion assesses the extent to which the student’s report provides evidence of evaluation of the investigation and the results with regard to the research question and the accepted scientific context.

|  |  |
| --- | --- |
| Mark | Descriptor |
| 0 | The student’s report does not reach a standard described by the descriptors below. |
| 1-2 | A conclusion is **outlined** which is not relevant to the research question or is not supported by the data presented. The conclusion makes superficial comparison to the accepted scientific context.Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **outlined** but are restricted to an **account** of **the practical** or **procedural issues** faced. The student has **outlined** very few realistic and relevant suggestions for the improvement and extension of the investigation. |
| 3-4 | A conclusion is **described** which is relevant to the research question and supported by the data presented.A conclusion is described which makes some relevant comparison to the accepted scientific context.Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **described** and provide evidence of some awareness of the **methodological** issues\* involved in establishing the conclusion.The student has **described** some realistic and relevant suggestions for the improvement and extension of the investigation. |
| 5-6 | A detailed conclusion is **described and justified** which is entirely relevant to the research question and fully supported by the data presented.A conclusion is correctly **described and justified** through relevant comparison to the accepted scientific context.Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **discussed** and provide evidence of a clear understanding of the **methodological issues\*** involved in establishing the conclusion. The student has **discussed** realistic and relevant suggestions for the improvement and extension of the investigation |

\*See exemplars in TSM for clarification

Communication

This criterion assesses whether the investigation is presented and reported in a way that supports effective communication of the focus, process and outcomes.

|  |  |
| --- | --- |
| Mark | Descriptor |
| 0 | The student’s report does not reach a standard described by the descriptors below. |
| 1-2 | **The presentation of the investigation is unclear, making it difficult to understand the focus, process and outcomes.**The report is not well structured and is unclear: the necessary information on focus, process and outcomes is missing or is presented in an incoherent or disorganized way.The understanding of the focus, process and outcomes of the investigation is obscured by the presence of inappropriate or irrelevant information.There are many errors in the use of subject-specific terminology and conventions\*. |
| 3-4 | **The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.**The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way. The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation. The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding. |

\*For example, incorrect/missing labelling of graphs, tables, images; use of units, decimal places. For issues of referencing and citations refer to the “Academic honesty” section.

**Practical Scheme of Work (PSOW)**

Rationale for practical work

Although the requirements for IA are centered on the investigation, the different types of practical activities that a student may engage in serve other purposes, including:

• illustrating, teaching and reinforcing theoretical concepts

• developing an appreciation of the essential hands-on nature of much scientific work

• developing an appreciation of scientists’ use of secondary data from databases

• developing an appreciation of scientists’ use of modelling

• developing an appreciation of the benefits and limitations of scientific methodology.

Options for PSOW:

• short labs or projects extending over several weeks

• computer simulations

• using databases for secondary data

• developing and using models

Time allocation for practical work

The recommended teaching times for all Diploma Programme courses are 240 hours at HL. Students at HL are required to spend 60 hours, on practical activities (excluding time spent writing up work). These times include 10 hours for the group 4 project and 10 hours for the internal assessment investigation. (Only 2–3 hours of investigative work can be carried out after the deadline for submitting work to the moderator and still be counted in the total number of hours for the practical scheme of work.)

**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**

The syllabus for the Diploma Programme biology course is divided into 4 parts: the core, the AHL material options, and PSOW A syllabus overview is provided below.

**Teaching hours**

**Core 95**

Topic 1: Cell Biology 15

Topic 2: Molecular Biology 21

Topic 3: Genetics 15

Topic 4: Ecology 12

Topic 5: Evolution and biodiversity 12

Topic 6: Human physiology 20

**AHL 60**

Topic 7: Nucleic acids 9

Topic 8: Metabolism, cell respiration and photosynthesis 14

Topic 9: Plant biology 13

Topic 10: Genetics and evolution 8

Topic 11: Animal physiology 16

**Option 25**

Option A: Neurobiology and behavior

Option B: Biotechnology and bioinformatics

Option C: Ecology and conservation

Option D: Human physiology

**Practical Scheme of work 60**

Practical Activities 40

Individual investigation (internal assessment IA) 10

Group 4 Project 10

**Total Hours: 240**

**Mathematical Requirements**

**All Diploma Programme biology students should be able to:**

• perform the basic arithmetic functions: addition, subtraction, multiplication and division

• carry out calculations involving means, decimals, fractions, percentages and ratios

• represent and interpret frequency data in the form of bar charts, graphs and histograms, including direct and inverse proportion

• plot 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

• determine the mode and median of a set of data, calculate and analyse standard deviation

• select statistical tests appropriate for the analysis of particular data and interpret the results.

**Class Resources**

Textbook:

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

newest edition until our new text arrives

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

**Acknowledgements:**

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)