



Course Description: *This course will focus on understanding how science places such an important role in our daily lives and how we have an impact -both positive and negative- in our environment and our planet. During the first term, students will delve into the fascinating world of science starting with Cell Biology and focusing on the differences between eukaryotic and prokaryotic as well as understanding the role that bacteria and viruses play in cell evolution, going deeper into the essential understanding of how DNA holds the information for the function of cells, culminating by understanding what is the endocrine system and how does it regulate various functions of cells. Students will experience first hand how scientists perform investigations by designing, executing, researching and presenting a professional level experiment focused on genetics using fruit flies. The purpose behind this is to provide students with the necessary tools to be prepared to excel during their 11th grade Biology PBAT graduation requirement. The second term will focus on understanding the principles of Physics by means of addressing the effectiveness of Green Design applied to sustainability projects. Students will learn about energy and how we can have an impact on the environment based on our energy usage, look into Newton's laws of motion by working as an engineer to design blades for a wind turbine in order to increase it's efficiency and finally focus on the physics of music to understand why high volumes can damage your hearing.*

1st Term – Introduction to HS Biology

- **Unit 1: Cell Biology**

Objectives: In authentic contexts, students will be able to independently and flexibly use their learning to analyze the zone of inhibition after isolating a specific bacterial colony found on their desks to understand how bacterial colonies acquire resistance to antibacterial products which indicates the ability to evolve faster than higher order organisms as well as the link between protein expression to confer resistance. Students will measure the zone of inhibition and compare the data from two different antimicrobial products, they will represent the data using a graph, compare raw data to the mean. Using the data analysis to communicate the findings and the implications of the study. **The following essential questions will be analyzed during this unit:** Which characteristics do our cells share with prokaryotic organisms? Why should viruses be considered living? How do viruses aid in the evolution of cells? How can bacterial cells acquire resistance to various antibacterial products? Why are bacterial cells so essential for our survival? How does the cell manifest the characteristics of life? How is the cell like a complex society? How is cell differentiation related to protein expression? Why do certain cell lines have stem cells in the body?

- **Major Assessments:** **Antibacterial Resistance Assay:** Students will isolate a bacterial colony using T-streak method and expose that colony to an antimicrobial product of their choice in order to measure the zone of inhibition and analyze how bacteria are able to acquire resistance to antimicrobial products. Students will be exposed to writing a journal article to present the research.

- **Unit 2: Genetics**

Objectives: In various contexts and non-routine situations, students will be able to independently and flexibly use their learning to cite specific textual evidence to support the analysis of their own research, follow precisely a complex multistep procedure during the fruit fly research, translate quantitative information into a table or chart

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during the data collection and data analysis of their research, think critically about other research, compare and contrast findings, comprehend scientific journal articles, write a scientific journal article on their own research over an extended period of time, strengthen writing by revising, editing and rewriting, conduct a sustained research project on fruit flies sex-linked traits, draw evidence from scientific journal articles, participate in collaborative discussions on the advantages and disadvantages of genetic manipulation, present research findings to an audience of their peers using digital media and adapting their speech demonstrating proper use of formal English. **The following essential questions will be analyzed during this unit:** How does genotype determine phenotype? How does DNA unlock the information to give instructions to the body? Why do sex-linked diseases occur more often in males than females? How does genetic variation occur? Why are GMO's detrimental for the environment? How are mutations different to epigenetic modification? Is genetic manipulation the solution to genetic diseases in the future?

- **Major Assessments: Pre-PBAT fruit fly crossing research** - Students will choose the type of mutant flies they want to cross and they will create their own research with guidance of the teacher. Students will be in charge of creating the hypothesis, performing the study, collecting and analyzing data, writing a shorter version of a PBAT scientific journal article, the paper should include an abstract, introduction, materials and methods, results and discussion.

● Unit 3: Reproduction and Development

Objectives: In various contexts and non-routine situations, students will be able to independently and flexibly use their learning to determine the central ideas or conclusion of a scientific text, understand the meaning of key terms related to human reproduction and embryonic development, understand how the endocrine system plays a crucial role in embryonic development as well as sexual development. Analyze how different toxins in the environment can cause an unbalance in the body, which can lead to various conditions during embryonic development and sexual development. **The following essential questions will be analyzed in this unit:** Which chemicals produced by the body regulate development and reproduction? How can chemicals disrupt embryonic development and sexual development? How does the menstrual cycle regulate reproduction? How is the male reproductive cycle different and similar to the female reproductive cycle? Why is obesity linked to a specific hormone production?

- **Major Assessments: Endocrine Disruptors Newspaper article** - Students will choose a toxin of their interest and they will conduct a guided research on the effects of the toxin to the endocrine system and the body. This study will help students understand how toxins affect the male reproductive system. They will write an op-ed article to inform other students about the danger of Endocrine Disruptors.

2nd Term – Introduction to HS Physics

● Unit 1: Energy

Objectives: In various contexts and non-routine situations, students will be able to independently and flexibly use their learning to understand which are our energy resources as well as differentiate between nonrenewable vs. renewable resources. Find out which appliances use the most energy and what are ways in which we can lower

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our energy use. Students will also be able to differentiate between parallel and series circuits and which circuit is appropriate to get more current. **The following essential questions will be analyzed in this unit:** What is energy? Can we get energy for free? Can we depend on renewable resources solely? How can we reduce our energy consumption? Which energy transfers would not occur if renewable energy was used instead?

- Major Assessments: **Home Energy Audit Newspaper article** - Students will use their knowledge of kWh and energy usage to analyze their home energy usage by means of an energy audit. They will also find out ways in which they can lower their energy usage.

- **Unit 2: Motion – Energy sequestration and Wind Turbine blade design**

Objectives: In various contexts and non-routine situations, students will be able to independently and flexibly use their learning to understand how Newton's laws of motion work on objects by using skateboards as an example. Students will learn how to calculate the coefficient of friction, spring constant as well as draw free body diagrams. They will work like engineers to understand how to design blades of wind turbines or sport shoe outsole and apply physics concepts as well as the engineering knowledge. **The following essential questions will be analyzed in this unit:** Why are forces unbalanced when an object accelerates? Why do some surfaces have more friction than others? How is the job of an engineer different from the job of a scientist? How do you optimize a prototype? What are the limitations and constraints of a prototype?

- Major Assessments: **Wind turbine blade design**- Students will apply their knowledge of physics and engineering to design wind turbine blades that are efficient and can harness the highest amount of wind energy with the highest efficiency. Students will apply their knowledge of Newton's laws, forces, understanding of the engineering process, as well as the coefficient of friction and calculating the efficiency of their design

- **Unit 3: Waves – Music**

Objectives: In various contexts and non-routine situations, students will be able to independently and flexibly use their learning to understand what are waves and how music travels in the form of waves. Students will learn the anatomy of the ear to understand which type of wave can damage hearing. They will be able to discern between frequency and wavelength. **The following essential questions will be analyzed in this unit:** What are sound waves? Which sound waves can damage your hearing and why? Can high frequencies damage your hearing? Which parts of the ear anatomy get damaged when exposed to high amplitudes? How can you prevent noise induced hearing loss?

- Major Assessments: **Analyzing the wave intensity of my music device** - Students will conduct their own research by using their music device in order to analyze the wave intensity and whether the volume they use is causing internal ear damage, they will create an ad to inform other students in the school about this issue.

Single Grade Class Grading Policy

- **Exhibitions 25%** - There will be one exhibition for each unit.

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- **Term final, end of unit test and quizzes 25%*** - There will be a test at the end of each unit to assess if students understood the concepts learned in each unit. Finals will encompass main ideas learned in each term, 1 final per term. (*note: quizzes, tests and finals will be weighted differently)
- **CER's 15%** -Each unit will have at least 5 claim evidence response essay's (CER)
- **Labs 15%** - There will be at least 2 labs per unit.
- **Graded Homework 10%** - Students will be given homework everyday to expand on or reinforce concepts learned, one HW per week will be graded for feedback. **Late HW's will not be accepted.**
- **Class Participation 5%** -participating in discussions and group work, attendance, warm up completion, in class work (handout completion) and HW turned in or completed on time.
- **Exhibitions turned in on time/completed rationales 5%** -If exhibition is not turned in on time students will lose points each day until the cut off date which that exhibition will not be accepted any more.

Making up Major Assignments

- **Students will be allowed to make up** exhibitions, quizzes, test, Finals, CER's and labs **only with doctor's note or parent/guardian note. There will be a time limit for making up assignments.**

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