Diploma Programme subject outline—Group 4: sciences

School name	ELA GREEN SCHOOL	**School code**	060876
Name of the DP subject *(indicate language)*	IB Biology		
Level *(indicate with X)*	Higher [X] Standard completed in two years [*] Standard completed in one year * [ ]		
Name of the teacher who completed this outline	INDUMATHI.E	**Date of IB training**	3rd MAY 2023
Date when outline was completed	14th April 2023	**Name of workshop** *(Indicate name of subject and workshop category)*	IB Category 1

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

- Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.

- This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.

- This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.

- If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

The aim of the syllabus is to integrate **concepts**, **topic content** and the **nature of science** through inquiry.

Topic/unit (as identified in the IB subject guide) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time			Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
		One class is	45	minutes.		
		In one week, there are	5	classes.		

Year 1 **Semester: 1** **Theme: A) Unity and diversity** **Theme: B) Form and function**	**Level of organization:** A1: Molecules A2: Cells A3: Organisms A4: Ecosystems B1: Molecules B2: Cells	A1.1 Water *[SL/HL]* A1.2 Nucleic Acids *[SL/HL]* A2.1 Origins of Cells *[HL]* A2.2 Cell Structure *[SL/HL]* A2.3 Viruses *[HL]* A3.1 Diversity of organisms *[SL/HL]* A3.2 Classification and cladistics *[HL]* A4.1 Evolution and speciation *[SL/HL]* A4.2 Conservation of biodiversity *[SL]* B1.1 Carbohydrates and lipids B1.2 Proteins B2.1 Membranes and membrane transport B2.2 Organelles and compartmentalisation B2.3 Cell specialization	*SL: 5 hours HL: 3 hours* *SL: 4 hours HL: 5 hours* *SL: 6 hours HL: 2 hours* *SL: 7 hours HL: 1 hours* *SL: 6 hours HL: 2 hours* *SL: 7 hours HL: 5 hours*	**Summative Assessment** Summative task based on objectives 1,2& 3 **Formative Assessment** Lab writeup, graphs, **ATL skills targeted:** Develop thinking skills, communication skills, and research skills. **LPA:** Open minded and Principled	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Animal behavior lab document (observational lab) Discussion centered around animal experimentation policy & ethics Water lab Youtube videos & other visual aids to support learners Concept maps & learning targets *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology

Semester: 2 **Theme: B)** **Form and function** **Theme: C)** **Interaction and interdependence**	B3: Organisms B4: Ecosystems C1: Molecules C2: Cells C3: Organisms	B3.1 Gas exchange B3.2 Transport B3.3 Muscle and motility *[HL only]* B4.1 Adaptation to environment B4.2 Ecological niches C1.1 Enzymes and metabolism *[SL/HL]* C1.2 Cell respiration *[SL/HL]* C1.3 Photosynthesis *[SL/HL]* C2.1 Chemical signaling *[HL]* C2.2 Neural signaling *[SL/HL]* C3.1 Integration of body systems *[SL/HL]* C3.2 Defense against disease *[SL]* C4.1 Populations and	*SL: 6 hours AHL: 6 hours* *SL: 7 hours* *SL: 8 hours AHL: 8 hours* *SL: 3 hours AHL: 7 hours*	**Summative Assessment** Summative task based on objectives 1,2& 3 **Formative Assessment** Quizzes, Activities Virtual Labs, Lab reports Oral presentations, Class discussions, **ATL skills targeted:** Develop thinking skills, communication skills, and research skills. **LPA:** Caring and Risk takers **Internal Assessment**	Microscopes & prepared slides Micrograph images of cells Potatoes Rulers *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Molecular Modeling Kits Jmol Software Table Markers Enzyme Catalysis Lab Uniprot Database Chromatography *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources

Semester: 3 **Theme: C)** **Interaction and interdependence** **Theme: D)** **Continuity and change**	C4: Ecosystems D1: Molecules D2: Cells D3: Organisms	communities *[SL]* C4.2 Transfers of energy and matter *[SL]* D1.1 DNA replication D1.2 Protein synthesis D1.3 Mutations / gene editing D2.1 Cell and nuclear division *[SL/HL]* D2.2 Gene expression *[HL]* D2.3 Water potential *[SL/HL]* D3.1 Reproduction *[SL/HL]* D3.2 Inheritance *[SL/HL]* D3.3 Homeostasis *[SL/HL]*	*SL: 10 hours AHL: 2 hours* *SL: 10 hours* *SL: 8 hours AHL: 7 hours* *SL: 2 hours AHL: 6 hours*	Self-designed Investigation and Report Student Experiments (10 hours) **ATL skills targeted:** Develop thinking skills, communication skills, and research skills. **LPA:** Caring and Risk takers **Final Examinations**	adapted from https://www.bioknowledgy.info/ Schoology pGlo Lab *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Case Studies POGIL *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/
Semester: 4 **Theme: D)** **Contin**	D4: Ecosystems	D4.1 Natural selection *[SL/HL]* D4.2 Stability and change *[SL/HL]* D4.3 Climate change *[SL/HL]*	*SL: 12 hours AHL: 8 hours*	**ATL skills targeted:** Develop thinking skills, communication skills, and research skills.	-Schoology -Resin preserved specimens *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources

uity and change			*SL: 9 hours AHL: 5 hours*	**LPA:** Balanced and Reflective	adapted from https://www.bioknowled gy.info/ -Schoology -Ravine Study *Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowled gy.info/ Schoology

2. The group 4 project

As the IB guides say, “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.’” Describe how you will organize this activity. Indicate the timeline and subjects involved, if applicable.

A meeting of all G4 teachers were held to enlist the options relevant for the group 4 project including location and activity that can be performed on each science subject – such as water parks, Water reservoir, food factory, etc. A decision will be made after agreement with the students.

3. IB practical work and the internal assessment requirement to be completed during the course

As you know, students should undergo practical work related to the syllabus.

- Physics, chemistry and biology: 40 hours (at standard level) or 60 hours (at higher level)
- Computer science: 40 hours (at standard level) or 40 hours (at higher level)
- Design technology: 60 hours (at standard level) or 96 hours (at higher level)
- Sport, exercise and health science: 40 hours (at standard level) or 60 hours (at higher level)

Unit	**Practical Activities (SL)**	**Practical Activities (HL)**	
SEMESTER 1 A1: Molecules	DNA Extraction	Molecular Visualization (Nucleosomes)	1 Data logging, 2 Graph plotting software, 3 spreadsheets 4 Data base / Computer
A2: Cells	Microscopy		
A3: Organisms	Karyotyping Activity Genome Databases	Dichotomous Key	
A4: Ecosystems	Phylogeny Tree		
B1: Molecules	Starch Hydrolysis (Diastase / Amylase)	Molecular Visualization (Protein Structure)	

B2: Cells	Agar Cube Diffusion (SA: Vol Ratio)	Beetroot Permeability	
SEMESTER 2			
B3: Organisms	Respirometry Stomatal Density Heart Rate Experiment Histology (Blood / Plants)		
B4: Ecosystems	Transect Data Model Skull Comparisons	Goniometer	
C1: Molecules	Yeast Fermentation Chromatography Leaf Disc Experiment	Enzyme Inhibitor Experiment	
C2: Cells		Oscilloscope Traces	
SEMESTER 3			
C3: Organisms	Bacterial Growth (ZoI)	Seedling Phototropism	

C4: Ecosystems	Lincoln Index Activity Yeast Growth Curve Chi-Squared Test Activity Food Chain Activity		
D1: Molecules	Transformation (pGLO)		
D2: Cells	Potato Cube Osmosis	Mitotic Index Genetic Barley	
SEMESTER 4			
D3: Organisms	Virtual Rat Dissection Gene Database Activity	Chi-Squared Test (Dihybrid Crosses)	
D4: Ecosystems	Case Study: Guppies Mesocosm Experiment	Allele Databases (Hardy-Weinberg)	

Each course plan is based on the premise that the school year consists of four 10-week terms and so the 2-year Diploma consists of roughly 70 weeks.
Of the 70 weeks, 64 weeks were allocated for teaching the content (roughly 16 weeks per theme) and 6 weeks allocated to associated assessments.

Final Examinations

Level	Paper	Marks		Time	Content
SL	1A	30	55 (36%)	90 min	30 multiple-choice questions on standard level material
	1B	25			Four data-based questions related to experimental work and the syllabus
	2 – Section A	34	50 (44%)	90 min	Data-based question and short-answer questions on standard level material
	2 – Section B	16			Extended-response questions on standard level material (one of two options)
HL	1A	40	75 (36%)	120 min	40 multiple-choice questions on SL and AHL material
	1B	35			Four data-based questions related to experimental work and the syllabus

	2 – Section A	48	80 (44%)	150 min	Data-based question and short-answer questions on SL and AHL material
	2 – Section B	32			Extended-response questions on SL and AHL material (two of three options)

4. Laboratory facilities

Describe the laboratory and indicate whether it is presently equipped to facilitate the practical work that you have indicated in the chart above. If it is not, indicate the timeline to achieve this objective and describe the safety measures that are applicable.

Glassware's, chemicals (dry and liquid), Permanent slides, Fire extinguishers, safety precautions, and other relevant equipment as per suggestion of IB-related practical's are available in the Biology Laboratory. Whenever needed to purchase, additional materials are purchased and obtained within a period of 1 month.

5. Other resources

Indicate what other resources the school has to support the implementation of the subject and what plans there are to improve them, if needed.

We have access to lab areas equipped with safety features. Our students have access to a natural habitat to observe. We have a collaborative science department that shares materials and lab ideas. We have library and computer labs that are available for research using infohio database.

6. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
02 Molecular Biology 05 Evolution & Biodiversity	Knowledge questions: What role do models play in the Acquisition of knowledge? How can model be useful even if it is false?Is prediction the primary purpose of models? In this unit we talk a lot about models because students have difficulty visualizing the 3D structure of molecules. This is the first time we introduce students to the connection between science and the theory of knowledge. We talk about why we use models in science and how that contributes to our knowledge of complex ideas & phenomena. The early part of the TOK course focuses on the validity of knowledge using the theory of evolution as an illustrative example. We talks with the students about what has led to our current understanding of our species and everything that exists. The discussion leads the students to the understanding that our knowledge is based on logic and reasoning, but it is constantly evolving as we add to the current body of research and study. We will discuss the scientific method, the experiments that have led us to our current knowledge of evolution, and we will discuss validity of research & the reasoning that puts evidence together.

7. Approaches to learning

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Molecular Collision and Example of Biological Molecular Reactions	Research: They are tasked to refer to chemistry databases of biological molecules of interest and cite relevant information or chemical analytical data regarding this connection of chemistry principles to studying molecular biology.

8. International mindedness

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyze it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
4.4 Climate Change	We will discuss how the concentration of gases in the atmosphere affect climates experienced at Earth's surface. Within this topic we will discuss how our climate in land-locked Ohio is different than coastal regions and island nations throughout the world. We will discuss how climate change affects the agricultural industry in Ohio, and compare that to other forms of agriculture globally. We chose this topic because it is a local and global issue, and we can connect with other IB Biology classes in other parts of the world to gain different perspectives.

9. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile

Internal Assessment	The practical lab work throughout the duration of the course, internal assessment, and group 4 project will collectively be used as an instructional tool to facilitate all aspects of the IB learner profile. We will discuss the IA as the topic that is used to develop the attributes of the profile. We begin the IA in the first quarter of the school year. The students must choose a biological topic of their choice, this promotes the reflection attribute as they begin to think about how biology relates to their own lives and what interests them in the core content. They develop the risk-taking attribute as they commit to a topic, and begin their experiment to which they are not certain of the outcome. They must be communicators as they collaborate with the teacher and their peers. During lab hours they communicate their schedules and plans to carry out their experiments successfully. They must be principled as they evaluate the ethics and safety considerations of their proposed work.

IB Biology linear Unit plan - TOPIC TITLE	
The unit is about…	
Big idea(s)	Macro concept(s) e.g., Form and function Interactions How we know / TOK
Key biological idea(s)	Micro-concept(s) e.g., Cell theory Central dogma 1 gene: 1 protein Predator prey interactions Lock and Key hypothesis
Curriculum content	Knowledge & understanding Understandings Applications
Prior knowledge	Brainstorm Self-assessment Diagnostic questions
Students will use …	
Habits of mind / Skills	Thinking- critical / creative Communication Social / collaborative Self-management Reflection / organisation Research International mindedness
Learner attributes	Caring, principled, open-minded, knowledgeable, thinker, inquirer, communicator, risk taker, reflective

Making learning visible	What does it look like? When to see student understanding.
Assessment	
Success criteria	Written work Visible thinking routines Test of past paper questions Spoken presentations Classroom discussions

Future knowledge When will this be used again, Second assessment chances Links to other topics / subjects
Learning activities
Sequence of activities Student engagement, Inquiry, Concepts, Local & Global Contexts, Technology #TLAP- Hooks (safari, costume, Mozart, mission impossible, backwards, mystery bag, real world scenario, extra credit challenge) Consider WHERETO Why? - the big picture Hook - engage Experience the main facts / skills Rethink - shift perspective to enhance understanding Tailor - personalize the learning / Organize the sequence DIRT – directed student reflection time
Reminders of student learning needs Differentiation Non-native speakers Absences Preferred styles
Reflection
Teacher reflections or Student feedback What worked? What could be improved? Reminders for the future.