ÉCOLE Jeannine Manuel
International understanding through a bilingual education

BIOLOGY SL

	Topic/unit	Contents	Allocated time One class is 95 minutes. In one week there are 2 classes.	Assessment instruments to be used	Resources
Year 1	Cell Biology	Structure of prokaryote and eukaryote cell, cell membranes, cell cycle	7 weeks	<u>Summative</u>: Short 10 minute tests every 2 weeks to test knowledge and recall. Major test at end of each Topic. End of term test will cover all work done that term. Kahoot Quiz <u>Formative</u>: Questioning Analysing student work in class or homework Summaries (in pairs) Think-pair-share Round robin charts Classroom polls (using Poll Everywhere app) Presentations Lab reports	The 10 minute tests will be written by me. For end of topic and end of term tests I will use past papers as much as possible. Some older papers may need amending to match new syllabus Pupils will have access to science deparment laptops. Library: Chemistry Review, Physics Review and Biological Science Review (publisher: Philip Allan). Hardcopies from September 2018. Back catalogues online. Diverse general science reading books. Textbook: Biology By Allott and Mindorff (Oxford UP)
	Molecular Biology	Biochemistry of carbohydrates, water, lipids, proteins, enzymes, DNA, RNA. DNA replication, transcription, translation. Cell respiration. Photosynthesis.	7 weeks		
	Genetics	Genes, chromosomes, sex determination, meiosis, genetic inheritance, gene modification and biotechnology.	5 weeks		
	Ecology	Ecology terms, food chains and webs, C cycle, climate change.	4 weeks		
	Class Practicals and Prescribed Practicals		4 weeks		
	Individual Investigation		5 weeks		

Year 2	Evolution and Biodiversity	Evidence for evolution, natural selection, classification, clades.	4 weeks	Same assessment options as in Year 1 but with more emphasis on use of past exam questions and exam style questions.	Library Online Resources: JSTOR Bibliotheque Ecole Jeannine Manuel (has links to online libraries such as PLOS (Public Library of Science) and Science 360 video collection. New Scientist
	Human Physiology	Digestion and absorption, blood circulation (vessels and heart), immune system (natural and acquired), gas exchange, neurones, hormones, homeostasis, reproduction.	7 weeks		
	Option	One of the following: Neurobiology and Behaviour Biotechnology and Bioinformatics Ecology and Conservation Human Physiology	5 weeks. The option studied will be Ecology and Conservation. It links very well with the core topic (Ecology) and some of the sampling techniques will be studied before the IA. Standard Level pupils find this option easier to access.		
	Class Practicals and Prescribed Practicals		4 weeks		

Revision : The teaching programme has included 2 weeks of exam revision in Year 1 (total 34 weeks instruction) and 4 weeks exam revision in Year 2 (total 24 weeks instruction).

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BIOLOGY HL

	Topic/unit	Contents	Allocated time	Assessment instruments to be used	Resources
			One class is 95 minutes. In one week there are 3 classes.		
Year 1	Cell Biology	Structure of prokaryote and eukaryote cell, cell membranes, cell cycle	4 weeks	Summative: Short 10 minute tests every 2 weeks to test knowledge and recall. Major test at end of each Topic. End of term test will cover all work done that term. Kahoot Quiz Formative: Questioning Analysing student work in class or homework Summaries (in pairs) Think-pair-share Round robin charts Classroom polls (using Poll Everywhere app) Presentations Lab reports	The 10 minute tests will be written by me. For end of topic and end of term tests I will use past papers as much as possible. Some older papers may need amending to match the syllabus. Library: Chemistry Review, Physics Review and Biological Science Review (publisher: Philip Allan). Hardcopies from September 2018. Back catalogues online. Diverse general science reading books. New Scientist (online) Textbook: Biology By Allott and Mindorff (Oxford UP)
	Molecular Biology	Biochemistry of carbohydrates, water, lipids, proteins, enzymes, DNA, RNA. DNA replication, transcription, translation. Cell respiration. Photosynthesis.	4 weeks		
	Genetics	Genes, chromosomes, sex determination, meiosis, genetic inheritance, gene modification and biotechnology.	4 weeks		
	Ecology	Ecology terms, food chains and webs, C cycle, climate change.	3 weeks		
	Class Practicals and Prescribed Practicals		4 weeks		
	Individual Investigation		4 weeks		

	Nucleic Acids	DNA structure and replication, transcription and gene expression, translation.	2 weeks		
	Metabolism, cell respiration and photosynthesis	Metabolism, glycolysis and Kreb's cycle, biochemistry of photosynthesis.	3 weeks		
	Plant Biology	Transpiration, translocation, plant growth, plant reproduction.	3 weeks		
	Genetics and Evolution	Meiosis, Mendelian and non Mendelian inheritance, speciation.	2 weeks		
Year 2	Evolution and Biodiversity	Evidence for evolution, natural selection, classification, clades.	2 weeks	Same assessment options as in Year 1 but with more emphasis on use of past exam questions and exam style questions.	Library Online Resources: JSTOR Bibliotheque Ecole Jeannine Manuel (has links to online libraries such as PLOS (Public Library of Science) and Science 360 video collection. New Scientist (online) Also one copy of alternative text books for the course; eg Cambridge, Pearson. These will be stored in the Library.
	Human Physiology	Digestion and absorption, blood circulation (vessels and heart), immune system (natural and acquired), gas exchange, neurones, hormones, homeostasis, reproduction.	5 weeks		
	Animal Physiology	Antibody production and vaccination, animal movement, the kidney and osmoregulation, sexual reproduction.	4 weeks		

	Option	One of the following: Neurobiology and Behaviour Biotechnology and Bioinformatics Ecology and Conservation Human Physiology	6 weeks. Option studied will be Ecology and Conservation (see Standard Level for reasons). If a pupil wants to study another option independently it should be allowed, with advice from teacher. If class want to study another option (not Ecology)it can be discussed.		
	Class Practicals and Prescribed Practicals		4 weeks		

Revision : 1 week of exam revision in Year 1 (total 34 weeks instruction) and 3 weeks exam revision in Year 2 (total 24 weeks instruction).

1. The group 4 project

Several weeks before the start of the Group 4 Project introduce pupils to the Group 4 Project and ask them to contribute their ideas for a Project.
Emphasise cross-curricular links such as with history, geography, economics, bio/chjem/phys.
A decision will be made as to which Project to use and then all pupils will do the same Project.
Assign all pupils of Group 4 subjects (Years 1 and 2) into groups of 3 or 4 pupils (currently we envisage a cohort of around 40 pupils in Years 1 and 2).
Ensure that at least three subjects are represented in each group.
Give pupils several weeks to prepare and plan for their Project.
Allocate one full day for pupils to carry out the Project. This date should be made known to pupils, parents and other teachers several weeks in advance.
Pupils must be made aware of the importance of being prepared to carry out their Project on that day.
Allow 1 hour before the project day to give final instructions to pupils.
Allow pupils 6-7 hours to complete their Project on the Project Day.

Suggested topics for Group 4 work could include :
1. How different sounds (or different frequencies) affect heart rates. Could be linked to helping reduce stress in institutions for young people.
2. Building an effective solar oven to cook an egg using sustainable recyclable materials. The focus will be on making an oven that can be sent cheaply overseas to be used by families with limited access to electricity or firewood. Solar oven must be easy to assemble.

On the afternoon of the Project Day groups present their findings, and evaluate their methodology to other pupils. Parents, teachers, school governors and other interested parties (charity groups ?) can be present. This is expected to last 1-2 hours.

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

Name of the topic	Experiment	Any ICT used?
Acids and bases	Titration	Yes
Cell Biology	**Using a light microscope to see cell structures. Calculate magnifications, cell sizes**	
Cell Biology	**Estimate osmolarity in tissues (Prescribed)**	Calculating osmolarity and graphing. Display data in spreadsheets.
Cell Biology	Importance of cell size in relation to surface area to volume ratio (diffusion of dye)	Graphing. Spreadsheets for data processing.
Cell Biology	Calculating the mitotic index of root tip cells	Use computer simulation to model stages to aid identification of each stage.
Molecular Biology	Investigate a factor that affects enzyme activity	Graphing. Data loggers to measure changes in pH, temperature.
Molecular Biology	**Separate photosynthetic pigments using chromatography (Prescribed)**	
Molecular Biology	Use Benedict's Test to estimate an unknown glucose conc by compaing to known conc.	Graphing
Molecular Biology	Use of immobilised enzymes to remove lactose from milk.	Data loggers to detect changes in pH using pH probe.
Molecular Biology	Extraction of DNA from fruit cells.	
Genetics	Gel electrophoresis	
Ecology	**Set up a sealed mesocosm (Prescribed)**	Use time lapse camera to monitor development of the mesocosm.
Human Physiology	**Monitor human ventilation at rest and after exercise (Prescribed)**	Use data logger linked to LoggerPro to graph changes.Carbon dioxide probe.

Human Physiology	Comparing elasticity of arteries and veins using masses.	
Human Physiology	Disect heart	Ask pupils to film their disection and explain what they are doing and what they are seeing. Pupils edit the films and then present to junior classes.
Plant Biology	**Micropropagation of plants (HIGHER ONLY)**	
Plant Biology	**Measurement of transpiration rates using potometers (Prescribed) HIGHER ONLY**	

3. Links to TOK

Topic	Link with TOK (including description of lesson plan)
Topic 1 : Cell Biology	Biology offers many oportunities to instruct TOK learning. 1. The development of the model for cell membrane structure demonstrates how improvements in aparatus can lead to changes in accepted models and theories. Pupils can look at evidence for membrane models from the 1920s (Gorter and Grendel), to the improved electron micrographs that led to the Davson-Danielli model of the 1930s, to new techniques (antibody tagging) that led to the Singer-Nicolson model of the 1960s. By presenting pupils with the findings for each set of evidence they can see how the model for membrane structure has been adapted to fit new discoveries. 2. Linking Biology to everyday life is an important part of TOK. Human Genome Project, global warming, invasive species and stem cell research are just a few of the topics covered in IB Biology that have links to everyday life.
Topic 5 : Evolution and Biodiversity	1. YouTube clip Friends Season 2 Episode 3 where Phoebe and Ross argue about evolution and the evidence for and against it. Excellent discussion starter on the nature of science and the sientific method.

4. Approaches to learning

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Topic 1 : Cell Biology Topic 6 : Human Physiology	Research Skills. The Biology IA presents an opportunity for pupils to develop their research skills from planning to collecting and recording data to interpreting and presenting data. For a shorter term exercise pupils could choose one country and prepare a short 3 minute presentation on the legal situation in the country with respect to embryonic stem cell research. The pupils would be required to give reasons for the current legal status (religious, voter decision, government decision, etc) and if exceptions exist. Links to the IB Learner Profile as Communicators. Another possible Research Skill opportunity would be for pupils to reaearch a named hormone in the syllabus and present required information on it to the class to include site of production, effect, effect of over or under production.

5. International mindedness

Topic	Contribution to the development of international mindedness (including resources you will use)
Topic 4 : Ecology	Global Warming recognises no boundaries and finding ways to limit/rverse its effect must be done with international cooperation. Students can look at renewable projects around the world (such as the Kondoa Solar PV Project in Tanzania which will provide energy to three countries) and how international cooperation can reduce carbon footprints. Students look at the lives of those people affected by rising sea levels (eg Solomon Islands) and how this will impact other countries by island refugee movement. Students can assess the claims by less economically developed countries that the more economically developed countries have caused the global warming problem and so they should bear the cost of reducing the problem.

6. Development of the IB learner profile

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Topic 1 : Cell Biology	IB Learner Profile : Open Minded Pupils investigate the differing views on the use of embryonic stem cells and debate the advantages of embryonic stem cell research vs the ethical implications. This will introduce pupils to differing views on the embryo in different countries (for example, in Italy the embryo is recognised as a subject of rights from fertilisation) and challenge their own views on the nature of the embryo and its possible use in research. This debate format would have strong links to other aspects of the IB Learner Profile, such as communicators, caring, reflective and princpled.