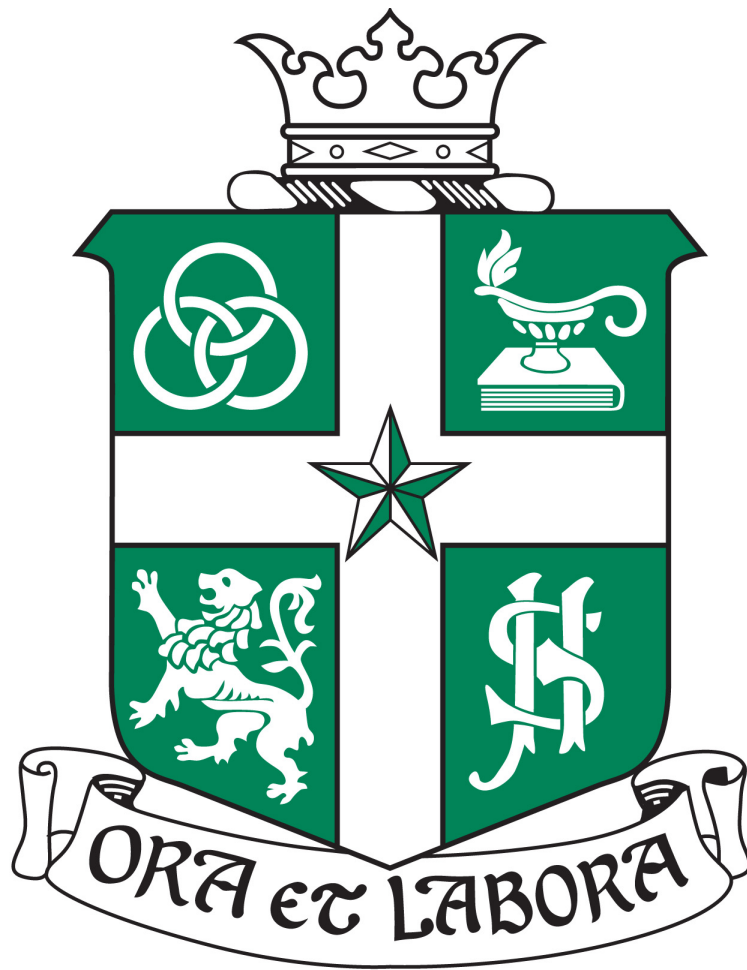


ST. JOSEPH'S INSTITUTION INTERNATIONAL MALAYSIA



BIOLOGY HANDBOOK 2017-18

Why study Biology?

Biology is for students who are interested in the subject. Biology teaches you about organisms: their molecular make-up, how they work, their environment, their relationships and interactions, how their features are inherited, their evolution and how they are used by man.

Biology involves thinking, evaluating, predicting, researching and working things out for yourself. Also, if you like practical work and like being out in the environment, amongst living things, you will enjoy Biology.

As a subject, many universities require Biology for the study of medicine, dentistry, pharmacy or veterinary science. Otherwise, Biology is a respected, analytical subject that will help support your application to almost any course.

At SJI Malaysia, Biology is offered at both higher level (HL) and standard level (SL).

Approaches to teaching and learning in Biology

The Biology course is “concept based”. That means that it is based on a number of “big ideas”. This includes ideas like:

- There is an unbroken chain of life from the first cells on Earth to all cells in organisms alive today
- Water is the medium of life
- The continued survival of living organisms including humans depends on sustainable communities

Learning to learn in the context of big ideas, rather than thinking every lesson is separate, is a very empowering way of appreciating learning in general.

In addition, the Biology course considers the very nature of science and asks students to think about these deeply. For example:

- Scientific research brings about ethical issues
- Patterns and trends often exist but there are discrepancies
- Scientific investigation must be carried out extremely meticulously, according to a well-established scientific method

And many more!

Thus the teacher will not expect you to simply learn information then repeat it in an examination. The teacher will expect you to take responsibility for your own learning. This is the same in all IB DP subjects, not just Biology.

This means that we expect you to develop a **broad set of skills**. How these skills can relate to Biology is outlined below.

Research skills – how to look up information and find things out for yourself in constructive ways, how to tell if information you have found is trustworthy and how to use information honestly. For example, you may want to research the arguments for and against climate change being due to man's activities.

Communication skills – this means expressing your judgements and views distinctly, writing responses to questions succinctly, and writing your individual assessment report well. Many students do not realise that even answering questions clearly in class is a communication skill!

Social skills – in Biology students often work in groups, for example during practical work. You are expected to participate fully, but also listen to and encourage the participation of others.

Thinking skills – these skills are required in Biology in every lesson! You must be prepared to learn how to analyse, explain, evaluate, discuss, make links and see the "big picture".

Self-management skills – these are crucial to success in the IB DP, because you will be studying a lot of subjects and participating in a lot of activities. You must be able to work independently, effectively and in an organised manner.

This means that your teacher will also use a **broad set of approaches**, including:

Inquiry – whilst teachers know that they have to give students information, they know that students finding things out and coming to conclusions by themselves rather than always being told is very good. You will be expected to find things out AND ask questions throughout your Biology course.

Emphasising concepts – teachers will try to encourage you to see the big pictures, like some of the ideas above, rather than expect you to see each lesson as an individual entity that can be pushed to one side as soon as it is over.

Differentiation – teachers will use a variety of teaching strategies and approaches so that everyone's different needs and preferred ways of learning can be addressed.

Development of independence – your teacher will set challenging tasks to do on your own, and have high expectations of you, so they will help you to develop their self-management skills.

Assessment – your teacher will use a variety of assessment methods and give feedback in different ways; he or she will also expect you to be able to assess your own and your classmates' work in a useful way. The aim is that you will not simply be looking to see what marks you have got – but what you *need to do next in order to improve*.

Biology and the IB learner profile

While you progress through your diploma programme studies and activities, you will develop a number of attributes. The IB calls this the IB “learner profile”. This table shows you what the learner profile attributes are and some examples of how Biology can help you develop these, taken from the Ecology topic.

We hope you will become ...	Example in Biology
Inquirers	Students should wish to find out how they themselves impact the environment, how it might contribute towards climate change, how energy flows in their own environments, what differing views towards climate change exist etc.
Knowledgeable	Students will build up knowledge based on factual content related to species, communities and ecosystems, energy flow, carbon cycling and climate change.
Thinkers	Students will need to understand concepts such as energy flow and material cycling as well as develop meaningful action whilst learning.
Communicators	Students will verbally communicate ideas, research findings, opinions and judgements. They will write reports of investigations e.g. to establish whether there is an association between two species in a field and keep written records of investigations e.g. the changes that occur in their sealed mesocosms. They will also respond to problems including a written data analysis exercise specifically requiring students to respond in full to questions.
Principled	Students will form and keep to their own views on issues such as recycling, reduction of waste, conservation of resources, causes of climate change etc.
Open-minded	In connection with the above, students will learn to respect others' views even though they feel others may not be right and/or they do not agree with them.
Caring	Students will learn how to respect and care for the environment .
Risk-takers	Students will need to uphold the principles they have developed even though this may generate disagreement with their peers.
Balanced	The topic contributes to the students' whole IB education .
Reflective	In particular, students will be able to evaluate claims that human activities are not causing climate change.

Topics studied

- Cell biology (cell structure and functioning)
- Molecular biology (the important molecules in living things such as carbohydrates, proteins, fats, water, DNA and RNA)
- Genetics (how the characteristics of organisms are passed on from generation to generation)
- Ecology (ecosystems and how organisms interact with their environment)
- Evolution and biodiversity (how organisms evolved and how they are all related to each other)
- Human physiology (how humans function including digestion, the blood, breathing etc.)
- Plant science (higher level only)
- Animal physiology (higher level only)

PLUS

One option, which is chosen by the teacher from the following:

- A Neurobiology and behaviour
- B Biotechnology and bioinformatics
- C Ecology and conservation
- D Human physiology

Biology in the timetable at SJIIM

The IB requires 240 hours of teaching for HL and 150 hours of teaching for SL. At SJIIM, HL Biology is allocated three double lessons per week and SL Biology is allocated two double lessons per week.

It sometimes happens that HL and SL Biology are taught in the same class. In this case, the teacher will let the SL students know when they do not need to come to lessons. Sometimes students will find they need to go to all three lessons in a week; sometimes they will only attend one or two of the lessons in a week and sometimes there will be periods of time when they will not be required to attend at all.

The IB Biology course

Biology, like all IB DP subjects, consists of two “components”.

The first of these is the theory and practical work taught during lessons, and which may be examined in the examination papers at the end of the course. Completed examination papers are sent to IB and marked by IB examiners.

The second of these is the ‘coursework’. In Biology, this is an individual investigation of about 10 hours work, that each student must complete. The student, with the teacher’s advice, chooses his or her own topic. The investigation is marked by the teacher according to a set of criteria, then sent to IB and checked by IB moderators.

Assessment criteria for the Biology individual investigation

So that you have some idea of what will be expected of you in advance, these are the criteria that teachers use to mark the individual investigation.

CRITERION	EVIDENCE
Personal engagement	Have I chosen a novel investigation? Have I shown that I have incorporated my own ideas and hypothesis? Have I designed or modified apparatus to use?
Exploration	Have I planned my investigation well, in accordance with scientific method?
Analysis	Have I looked at my results thoroughly, and have I processed them well into graphs etc., that make it easy to see what the results show?
Evaluation	Have I considered errors and weaknesses in my method and how it could be improved for next time??
Communication	Is my report clear and readable? Have I used the correct terminology? Have I referred to and cited sources of information correctly?

Difference between higher and standard level Biology

The difference between higher and standard level Biology is the amount of content, followed by slightly shorter examination papers. Higher level also has two extra topics (see the previous list). Because higher level has more content, in practice it is a bit more demanding. Students wishing to pursue a university level course in Biology or a related subject such as medicine or similar, should take higher level.

Final assessment in Biology

An overview of how you will be assessed on the final set of skills and knowledge that you have acquired is as follows.

LEVEL	ASSESSMENT	WEIGHTING (%)
HIGHER	3 exam papers	80
STANDARD	3 exam papers	80
EVERYONE	Individual investigation	20

Biology course outline

This table reflects the topics covered but not necessarily the order in which they will be taught.

Year 1	Topic 4	Ecology	5 weeks
	Topic 5	Evolution and biodiversity	5 weeks
	Topic 1	Cell biology	8 weeks
	Topic 2.1 – 2.7 and topics 7.1 – 7.3	Molecular biology integrated with AHL material on nucleic acids for HL classes	10 weeks
	FIELD COURSE	The prime aim of this is to conduct the individual investigation	5 days field course
	Topics 2.8-2.9, plus AHL topics 8.1-8.2 for HL classes	Respiration and photosynthesis	5 weeks
	Topic 3 integrated with AHL topic 10 for HL classes	Genetics including genetic modification and biotechnology	6 weeks
Year 2	Option	Will be taught in conjunction with the relevant core/AHL topic	4-5 weeks will need to be allocated
	Topic 9	Plant biology (only for HL classes)	6 weeks
	Topic 6 integrated with AHL topic 11 for HL	Human and animal physiology	10 weeks
	Examinations revision		4 weeks

Biology resources

Textbooks

The textbook we use is The Oxford IB Diploma Programme study guide: Biology, by Andrew Allott and David Mindorff.

This is a list of **other Biology textbooks** available for reference or loan in the school library:

Biology - IB Science skills, by Mike Boyle
Biology course companion, by Andrew Allott
Biology for the IB Diploma, by C.J. Clegg
Biology for the IB Diploma : exam preparation guide, by Brenda Walpole
Barron's IB Biology, by Camilla Walck
Advanced Biology, by Michael Kent

This list is growing all the time so do keep a look out.

Books of biological interest

There are **other books** of biological interest too, such as “Evolution, the Human Story” by Dr. Alice Roberts; “Genome” by Matt Ridley; “The Immortal Life of Henrietta Lacks” by Rebecca Skloot and many more, which will broaden your appreciation of Biology.

Biology flash cards

There are boxed sets of Biology flash cards available for reference in the Biology lab and in the school library.

Websites and apps

There are many websites and apps – not all of them reputable, so beware. Reputable and useful ones include:

Khan Academy (app)
BBC science environment http://www.bbc.com/news/science_and_environment
Learn genetics at Utah <http://learn.genetics.utah.edu/>
Biology animations <http://www.sumanasinc.com/webcontent/animations/biology.html>
NASA: climate change and global warming <http://climate.nasa.gov/>

IBDP Biology Course outline

Year	Term	Topics Covered	Summative Assessment
1	1	Cell biology (Topic 1) Ecology (Topic 4) Start evolution and biodiversity (Topic 5)	Cell biology Test Ecology test
	2	Finish evolution and biodiversity (Topic 5) Molecular biology (Topics 2,7): carbohydrates, lipids, proteins, DNA	Evolution and biodiversity test
	3	Molecular biology (Topics 2,8): photosynthesis and respiration Genetics core (Topic 3) Biology Field Course	Molecular biology test Photosynthesis test Respiration test INTERNAL EXAMINATIONS

Year	Term	Topics Learned	Summative Assessment
2	1	Genetics higher level (Topic 10) Plant science (Topic 9) Start human and animal physiology (Topics 6, 11)	Genetics test Plant science test
	2	Finish human and animal physiology (Topics 6,11) Option (TBC)	Human and animal physiology test Option test MOCK EXAMINATIONS
	3	Exam Preparation	EXTERNAL EXAMINATIONS