| Diploma Programme subject outline—Group 4: experimental sciences | | | | | | | | | | |
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| School name |  | | | | | | School code |  | | |
| Name of the DP subject |  | | | | | | | | | |
| Level  (indicate with X) |  |  |  | |  |  | | |  |  |
| Higher |  | Standard completed in two years | |  | Standard completed in one year \* | | |  |  |
|  |  |  | | |  |  |
| Name of the teacher who completed this outline |  | | | **Date of IB training** | | |  | | | |
| **Date when outline was completed** |  | | | **Name of workshop**  (indicate name of subject and workshop category) | | |  | | | |

\* 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.

|  | 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 |  | minutes. |
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| In one week there are |  | classes. |
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| Year 1 | Statistical analysis | Calculating standard deviations and explanation its significance; establishing relations between variables | 2 hours | | | Calculations, sums, discussion about correct calculations and meaning mathematics for natural science. | Text book |
| The chemistry of life | Chemical elements in organism. Water, its functions. Organic matters, DNA, replication and biosynthesis of protein. | 10 hours | | | Tests, discussions, workshops, individual/group research, making presentations. | Films, online communications, science articles, mediaresources |
| Cells | Cell theory, uni- and multicellular organisms (difference of its operation), ethical problems of cloning. Procariotic and eucariotic cells. Its structure. Cell structures. Mitosis. Cell vital functions(transpiration, photosyntesis) | 17 hours | | | statement, presentations, workshops, pair/group work, constructing models. | Mediaresourses: programs (simulation), text book, articles, videos, demonstration |
|  |  |
| Genetics | Chromosomes, genes and mutations. Karyotype and meiosis, human karyotype, the Human Genome Project,genotype and phenotype, mono- and dihybryde cross, multiple allels, sex linkage. Genetic engineering and biotechnology | 15 hours | | | Sums, constructing DNA model (pair work), discussion moral problems, discussion the future of genetic engineering and biotechnology, human health | Results of project “Human Genome Project”, articles, text book, |
|  | Option F microbes and biotechnology | Deversity of microbes, meaning microbes for medicine, food industry. | 15 hours SL, 22 hours HL | | |  |
|  | | | Labs, discussing, | Science journal, text book, |
| Year 2 | Ecology | Ecosystems its structure and organisation, the rule of 10 %, food chains and webs, the greenhouse effect, populations, suckcessions. | 10 hours | | | Group work: planning measures for preservation of nature, sums, discussion obout future of our Earth | videos (Discovery, National Geographics), excursion, mediaresourses |
| Evolution and classification | Species, selection, population, two examples of evolution. Binomial system of  nomenclature, levels of taxonomy | 6 hours | | | Games “the path of evolution”, discussion, determination of different organisms | Qualifier of plants, insects, videous, articles |
| Human health and physiology | Digestion, organism systems, immunity, diseases and AIDS, homeostasis, reproduction, | 20 hours | | | Tests, illustrations, presentations, research, workshops, practicals | Text book, videous, mediafiles, articles, athlas of anatomy |
| Option E Neurobiology and behaviour | Reflexes, synapses, behaviour. HL: human brain and mind, | 15/22 hours | | | Work in pairs (explanation of difference between somatic and vegetative reflex). | Athlas of anatomy, videous, Excursion to Medical University, |

1. 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.

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| Общий по всем предметам естественных наук. Физика, химия, биология, технология |

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

As you know, students should undergo 40 hours (at standard level) or 60 hours (at higher level) of practical work related to the syllabus. Use the table below to indicate the name of the experiment you would propose for the different topics in the syllabus. Indicate which experiments you would use for assessing each of the internal assessment criteria—design (D), data collection and processing (DCP) and conclusion and evaluation (CE).

An example is given. Add as many rows as necessary.

| Name of the topic | Experiment | Indicate the experiments you would use for assessing design (D),  data collection and processing (DCP) and conclusion and evaluation (CE)  (use D, DCP or CE) | Any ICT used?  Remember you must use all five within your programme. |
| --- | --- | --- | --- |
| Acids and bases | Titration | DCP | Yes |
| The chemistry of life | Test for starch | D |  |
| Test for protein | D |  |
| Test for lipid | D |  |
| Conditions of the digestive enzymes | D, DCP, CE | Yes |
| Cells | Options of cell membranes | D |  |
| Cell organells | CE |  |
|  |  |  |
| Plasmolyse and deplasmolyse | D |  |
|  | Changes in the number of colonies of bacteria, depending on the temperature change. | D, DCP, CE | yes |
| Genetics | Modification variability | D, DCP, CE | yes |
| Ecology | Limited factors | D |  |
| Research of ecosystems its populations | CE |  |
| Human health and physiology | Reaction time | DCP, CE |  |
| Eye and hand co-ordination | DCP, CE |  |
| Pulse rate | CE, DCP, D | yes |
| Effect of gastral ensimes on different organic matters | D |  |
| Measuring breathe rate in depending on different weight | CE | yes |

1. 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.

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| Laboratory “Pulse rate”. Describtion: student should state the objective using the knowledge about the nature of pulse and factors reacting on it.  The objective may look like: research the effect of exercise on heart rate changing.  Labware: a stopwatch, a pulse sensor, a chair, data table.  Methods, data collection and processing: 1) the work should be done in pares  2) pulse should be rated at first at rest (with a pulse sensor), notice the number of heart rate  3) during one minute (using the stopwatch) the student must do in series 10, 15, 20, 25,30, 35, 40, 45 ets squats. Between each metering the student must have a rest in three minutes  4) after every series the pulse rate should be marking in data table.  5) basing on received data upbuild a plot.  6) make a concluction  Conclusion and evaluation:  The number of heart rate depends on the amount of physical activity. |

1. 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.

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| Biology\_for\_the\_IB\_Diploma\_Cambridge, ib-biology-labban.com, [www.biologyforlife.com](http://www.biologyforlife.com) (it’s great resourse), |

1. 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.

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| --- | --- |
| Topic | Link with TOK (including description of lesson plan) |
| Cells | *Discuss the evidence for the cell theory*: The nature of scientific theories could be introduced here: the accumulation of evidence that allows a hypothesis to become a theory; whether a theory should be abandoned when there is evidence that it does not offer a full explanation; and what evidence is needed for a theory to be adopted or rejected**. Plan**: Before the lesson on the tables should be magnifiers, microscopes, different plant pieces, the slides, the photos of cell organells and electron microscope. At the beginning of the lesson class remembers positions of the cell theory. It’s proposed to show positions of the cell theory with further equipment (at first with magnifies, then with microscope ets.). Students should answer the question about necessary of technical progress for development of nature science. |
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1. 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 analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

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| --- | --- |
| Topic | Contribution to the development of international mindedness (including resources you will use) |
| Genetics | the Human Genome Project: this theme may show the common origin of human beings, failure of racism and perspectives of treatment genetics diseases – so it has international significance. Analysis of mitohondrial DNA shows that all people have common ancestor, using this project becomes able to introduce the concept genogeography, open the new possibility of treatment genetics diseases via methods of genetic ingeneering. There is involved ethical problem bonded with cloning and it may be discussed from different religions and cultures.  Resurses: there are a lot of Enternet resourses for example: <http://www.genome.gov/>, <http://www.hhmi.org/>, http://www.hhmi.org/ |

1. 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.

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| --- | --- |
| Topic | Contribution to the development of the attribute(s) of the IB learner profile |
| Ecology | Learning topics about ecological situation in different countries of the world, reading several articles showing different points of view on this problem (http://environmentalpeace.jimdo.com) the students take part in debates about the future of our planet. The activity is supposed to help the students learn how to work effectively in collaboration with others, listen effectively and respect points of view different from theirs. Thus they are encouraged to develop their communication skills and be knowledgeable and open-minded risk takers. |