JYVÄSKYLÄN LYSEO

IB DIPLOMA PROGRAMME

WRITTEN CURRICULUM

FIRST EXAMS IN 2020

IB MISSION STATEMENT

IB Mission statement:

The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the organization works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

THE PURPOSE OF THIS DOCUMENT

The written curriculum of Jyväskylän Lyseon lukio IB aims to describe the objectives, teaching and assessment of the subjects taught in the IB programme. The written curriculum design is based on the prescribed curriculum provided by the IB organization, teachers´ subject support and professional development workshop materials. The enacted curriculum is always a product of the interaction of a variety of beliefs, ideas and contextual and situational elements.

This written curriculum is the end result of extensive interdisciplinary design and writing work and has been revised annually to reflect the syllabus changes in different subjects and Core elements. The purpose of Curriculum is to be the basis for the teaching of the IB program of Jyväskylän Lyseo Upper Secondary School, as well as to bring local perspectives to it, thus enriching the implementation of the entire program in our school.

Susanna Soininen
IBDP Coordinator

Content

CORE

CORE: CREATIVITY, ACTIVITY, SERVICE

CAS Coordinators Zoe Holmila, Tuula Railo

Essential understandings

Creativity, Activity and Service (CAS) is at the heart of the Diploma Programme. It is one of the three essential core elements in every student´s Diploma Programme. It involves students in a range of activities alongside their academic studies throughout the Diploma Programme. CAS plays a role in helping students clarify their values. It also challenges the student to adopt the values inherent in the IB Learner profile.

The three components of the IB core are complementary with regards to learning, addressing global issues and students achieving personal growth. The core requirement provides an opportunity for students to be involved in in-depth study of a topic and question based on personal interest, within a subject area of their choice. (Jane Hanna, CAS Workshop, Berlin 2018).

The definitions of the strands of CAS:

Core

Creativity – exploring and extending ideas leading to an original or interpretive product or performance.

Activity – physical exertion contributing to a healthy lifestyle.

Service – collaborative and reciprocal engagement with the community in response to an authentic need.

Local focus

The focus of CAS in the Lyseo IB World School: CARING and THINKERS (from learner Profile)

In the Lyseo we value and support

* Students' own strengths, special expertise areas, courage to try new things and challenge him- or herself as well as others alone and together.

* Helping others, sharing expertise and good things (laittaa hyvä kiertämään).

* The change from "me" or "I" thinking to "you" and "we" thinking.

* The circular economy, i.e. making good environmental choices in everyday life.

* A balanced life where no-one needs to survive alone and where each of us is strong enough to ask "How can I help you?".

Transfer goals

"The IB aims to develop inquiring, knowledgeable and caring young people, who help to create a better and more peaceful world through intercultural understanding and respect."

Core

Creativity in CAS provides students with the opportunity to explore their own sense of their original thinking and expression. Creativity will come from the student´s talents, interests, passions, emotional responses and imagination; the form of expression is limitless. This may include visual and performing arts, digital design, writing, film, culinary arts, crafts and compositions. Students are encouraged to engage in creative endeavors that move them beyond the familiar, broadening their scope from conventional to unconventional thinking.

The aim of the Activity strand is to promote lifelong healthy habits related to physical wellbeing. Pursuits may include individual and team sports, aerobic exercise, dance, outdoor recreation, fitness training, and any other form of physical exertion that purposefully contributes to a healthy lifestyle. Students are encouraged to participate at an appropriate level and on a regular basis to provide a genuine challenge and benefit.

The aim of the Service strand is for students to understand their capacity to make a meaningful contribution to their community and society. Through service, students develop and apply personal and social skills in real-life situations involving decision-making, problem-solving, initiative and accountability for their actions. Service is often seen as one of the most transforming elements of CAS by promoting the student's self-awareness, offering diverse occasions for interactions and experiences and opportunities for international-mindedness. (CAS Guide 2015, IB Geneva)

Learning Outcomes

All seven Learning outcomes must be present for a student to complete the CAS requirement. Some may be demonstrated many times, in a variety of activities, but completion requires only that there is some evidence for each outcome.

1.Identify own strengths and develop areas for growth.

Core

Students are able to see themselves as individuals with various abilities and skills, of which some are more developed than others. 2. Demonstrate that challenges have been undertaken, developing new skills in the process.

A new challenge may be an unfamiliar experience or an extension of an existing one. The newly acquired or developed skills may be shown through new experiences or through increased expertise in an established area. 3. Demonstrate how to initiate and plan a CAS experience. Students can articulate the stages from conceiving an idea to executing a plan for individual or collaborative CAS experiences. Students may show their knowledge and awareness by building on a previous experience or by launching a new idea or process.

4. Show commitment to, and perseverance in, CAS experiences. Students demonstrate regular involvement and active engagement in CAS.

5. Demonstrate the skills and recognize the benefits of working collaboratively. Students are able to identify, demonstrate and critically discuss the benefits and challenges of collaboration gained through CAS experiences.

6.Demonstrate engagement with issues of global significance.

Students are able to identify and demonstrate their understanding of global issues, make responsible decisions and take appropriate action in response to the issue either locally, nationally or internationally. 7.Recognize and consider the ethics of choices and actions. Students show awareness of the consequences of choices and actions in planning and carrying out CAS experiences.

Local focus

Core

* Polite behaviour at school. Ethics in choices and encountering each other.

* From your own near surroundings => to local => to global

* By respecting yourself you are able to respect and appreciate others. From self- centered to people-centered thinking and behaving.

* Related party => to the neighbourhood => to the world

* How to find new aspects and learn new things also from yourself, when doing something you already know pretty well. => Reflecting yourself, growing as a human, developing yourself (Tutun tai uuden toiminnan suhde oppimiseen, kehittymiseen, itsensä tutkimiseen => taitojen kehittyminen, ihmisenä kasvaminen.) Relationship Between Familiar or New Activity for Learning, Development, Self-Research => Skills Development, Human Growth

> recognize and appreciate the things that are important for yourself

> recognize and appreciate your own physical and mental limits. (omien rajojen sekä fyysisten että psyykkisten rajojen tunnistaminen ja arvostaminen.)

> Be involved with creating a positive and mutually supportive atmosphere for the student community and beyond. (myönteisen ja toisia kannustavan ilmapiirin luominen opiskelijayhteisöön ja edelleen laajemmalle.)

Understand the reflection as a process and learn to value the knowledge you get through the processes.

Student Action

ManageBac and Wilma

Core

We use ManageBac as a final CAS portfolio. CAS portfolio is a collection of reflections and evidences of CAS experiences to demonstrate an engagement with CAS and achievement of the seven learning outcomes.

We use Wilma for assessing (three times during the IB years) and communication. Wilma is also a tool for parents to follow the progress of the CAS Programme.

Timeline

Preparatory year

* offers training courses of CAS strands: Music, Visual Arts and Physical Education, a total of three courses.

* supports to find out the philosophy of CAS and identifying own strengths through learning outcomes.

* students write a draft of CAS plan for the first IB year by thinking own interests in creativity, action and service.

During the preparatory year students get acquainted with community service and volunteering by visiting local non-governmental organizations and the nonprofit sector, and meeting representatives of voluntary organizations e.g. Multicultural Centre Gloria, Red Cross, the settlement of Jyvälä, BestBuddies of Jyväskylä.

At the end of the academic year students will be divided into teams. Each team has a team leader. Why teams? The meaning of the team is supportive. Team members support and

take care of each other in doing and writing CAS and reflections. The team leader is a liaison between the team members and the CAS coordinator or subject teachers. The team leader gets CAS.

Core

First IB year

CAS Starting Point session during the first days.

Teams and team leaders will be checked.

Writing sessions in timetable (e.g. once/period)

CAS plan uploaded to ManageBac by the 1st September.

First CAS conversation with CAS Coordinator during the 3rd period.

First year CAS will be finished by May 15th. Half of the CAS is completed.

Second IB year

CAS Starting point session during the first days.

CAS plan and CAS project plan uploaded to ManageBac by the 1st September.

CAS Conversation with CAS coordinator during the second period.

CAS completed during the 4th period.

CAS tutor/team Leader

IB-groups will be divided into teams (5-6students/team). The meaning of the team is supportive. Team members support and take care of each other in doing and writing CAS and reflections. One of the group members will be the team leader and he/she is a liaison between the team members and the CAS coordinator or subject teachers. The team leader gets CAS. (IB2) Team leaders will be also CAS tutors for younger

students. They may have consulting times e.g. once a month in the Library.

CAS Project

A CAS project is a collaborative, well-considered series of sequential CAS experiences, engaging students in one or more of the CAS strands of creativity, activity, and service. Everyone should be involved in a CAS Project al least once during the CAS Programme. The Project must be collaborative in nature, have a minimum duration of one month, use the CAS stages as a framework for implementation to ensure that all requirements are met. A risk assessment will be conducted.

A CAS project is one that reflects an issue of global significance, but is explored from a local perspective. It challenges students to show initiative, demonstrate perseverance, and develop skills such as collaboration, problem-solving, and decision-making.

Presentation of CAS projects and/or experiences

Each group/individual introduces their CAS project/experience as a poster. Posters are downloaded in peda.net or presented live.

In that presentation should be seen

-Name of Project/activity,

-Description and goals

-Chosen Learning Outcomes

-Pictures

-The five most important points of reflections (What was the best part? What did you learn? What would you do differently now?)

Core

TOK-links, EE-links

CAS and TOK are closely linked through the Area of Knowledge, the Ways of Knowing, the TOK framework and reflection. The reflection is central in both TOK and CAS. WOKs influence how we reflect on CAS experiences.

Both CAS and TOK are at the core of the IB Diploma Programme. TOK explores knowledge from both personal and shared knowledge perspectives.

Local focus:

Co-operation with TOK and EE teachers.

Tribe meetings.

Core-evening for all students and parents.

Ways of knowing and areas of knowledge we emphasize most in CAS are sense perception, emotion, reason and ethics.

Making CAS visible in our school.

TOK links

* Sense perception: In what way did sense perceptions influence your understanding of yourself regarding others and your surroundings?

* Emotion: Can you rely on your emotions to give a balanced view of your CAS experience?

* Reason: To what extent have you changed your certainties as a result of the CAS experiences?

* Ethics: What are the consequences of your action? To what extent might lack of knowledge be an excuse for unethical conduct?

Assessment

The assessment focuses on monitoring the progress of CAS, the meaningfulness and the purposefulness of experiences, understanding of learning outcomes and the quality of reflections. Half a year - assessment to Wilma will be marked three times during the IB years. Students use Wilma for self-assessing. CAS Coordinators take care of the quality of the CAS programme.

We use ManageBac and face-to-face meetings for ongoing monitoring and supportive feedback.

Three interviews with a CAS coordinator are an important part of the assessment during the student's CAS programme. The interviews will be documented on ManageBac.

The CAS programme is complete when all required experiences, evidences and reflections are done in good quality.

CORE: EXTENDED ESSAY

EE Coordinator Susanna Soininen

The extended essay is a coherent, in-depth study of a focused topic chosen by the student. "A pathway to university level studies."

Essential Understandings

- A formal piece of academic writing containing no more than 4,000 words + reflection (Reflections on planning and progress form, RPPF) no more than 500 words.
- Compulsory for all DP students
- Requires approximately 40 hours of work by the student.

- A supervision process of 3–5 hours, which includes three mandatory reflection sessions. The third and final mandatory reflection session is the viva voce (an interview with the supervisor).
- Externally assessed and, in combination with TOK, contributes up to three points to the total score for the IB Diploma (Student Handbook 2018). A student must achieve a D grade or higher to be awarded the Diploma.

Transfer Skills

- The EE promotes various "approaches to learning" skills (ATL skills).
- Students will learn to use academic writing and acknowledge the work of others (refencing, citation).
- Source evaluation skills: The use of the OPVL method (Origin, Purpose, Value and Limitations of the source). How to stop fake news!
- Students will understand the nature of academic knowledge and the significance of discipline literacy.
- The EE process will improve students´ self-management skills and their self-confidence.

Student Action

- Compulsory Research Skills Workshops for all IB1 students in fall term: The use of Academic Search elite & Ebsco Host.
- Compulsory EE information sessions for the IB1 students in March, (weeks 11 and 12).
- First meeting with the Subject Supervisor in late March.
- All deadlines for EE introduced in Managebac.
- Three mandatory reflection sessions and three mandatory check-inn sessions with the supervisor.
- The first draft of the EE delivered at the end of August (the beginning of the IB2 year).
- Final version of the essay delivered to the supervisor by the end of October (IB2).
- EE celebration and Core night in early December (IB2).
- Final steps and submission:

- The student must complete the last candidate comment section of the RPPF.
- The student then signs and dates the form and submits it to the supervisor.
- The supervisor adds the final comment to authenticate the process by signing and dating the form.

IB Learner Profile

The EE process is closely connected to the appreciation of the IB Learner Profile and promotes the students´ development toward becoming inquirers, knowledgeable, thinkers, communications, principled, open-minded, caring, risk-takers, balanced and reflective.

Assessment:

EE Assessment Criteria:
Total marks available 34
Criterion A: Focus and Method: Topic, Research Question, methods (6 marks)
Criterion B: Knowledge and Understanding: Context, subject-specific terms and concepts (6 marks)
Criterion C: Critical Thinking: Research, discussion & evaluation, analysis (12 marks)
Criterion D: Presentation: Structure and layout (4 marks)
Criterion E: Engagement: Process, research focus (6 marks)

TOK links

- The EE process develops students´ understanding of the nature of knowledge in a given subject, and vice versa – TOK with its emphasis on knowledge questions promotes the EE process.
- Which ways of knowing are used throughout the EE process? How can we justify the use of particular WoKs in acquiring knowledge?

CORE: THEORY OF KNOWLEDGE

TOK Coordinator Markus Lajunen
TOK teachers Markus Lajunen, Aarni Auerniitty, Zoë Holmila

Unit	Unit 1 What is Theory of Knowledge and completing the TOK presentation

Description
What is TOK?

Essential Understandings

- What is TOK?
- Nature of knowledge
- Knowledge questions
- Personal and shared knowledge
- Overview of Ways of Knowing (WOKs) and their overlap
- Overview of Areas of Knowledge (AOKs) and the knowledge framework
- WOK: Reason (argumentation and logic), Memory, Intuition and Sense perception.
- AOKs: Ethics, History, Human sciences, Mathematics and Natural sciences.

Transfer goals

- All TOK skills can be applied in other IB Subjects and different fields of life
- Studying the essential understandings in this Unit and completing the TOK presentation includes all ATL skills.

Inquiry questions

- What is TOK?
- What is the nature of knowledge?
- What are knowledge questions and how to generate them?

- What is meant by personal and shared knowledge?
- What is meant by Ways of Knowing (WOK) and Areas of Knowledge (AOK) in the TOK curriculum?
- What is reason as a WOK?
- How can argumentation be used as a part of the TOK presentation and TOK essay?
- What is needed for the TOK presentation in general?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Individual presentations
- Group presentations
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: TOK presentation (80%) and practise work with the TOK essay (20%)
- Formative: continuous self-assessment and teacher feedback

Learner Profile

Inquirers: TOK Unit 1 enables students to ask broad and general knowledge questions in TOK style on any topic. This fosters curiosity, enthusiasm and learning throughout life. Focus on different sciences and related WOKs in TOK Unit 1 will foster curiosity in scientific research and contribute to lifelong learning. Planning and completing the TOK presentation are all about inquiry.
Knowledgeable: Examining the differences and similarities of different sciences enables students to explore knowledge across a range of disciplines. TOK Unit 1 enables students to understand science as an international and multinational project. Students can show their

understanding of relevant concepts and understanding through the TOK presentation

Thinkers: All TOK is aimed to develop critical thinking skills. Understanding the basics of different sciences in TOK Unit 1 fosters critical thinking. The TOK presentation is a platform to showcase critical thinking skills.

Communicators: All TOK Unit 1 activities focuses on effective communication and collaboration between individuals and groups. Through understanding of different sciences TOK Unit 1 enables the students to become better communicators through different disciplines. TOK presentation enables the students to express themselves confidently and creatively.

Principled: The study of ethics in TOK Unit 1 enables students to become persons with a sense of fairness and justice. Moreover, TOK Unit 1 aims to develop respect for the dignity and rights of people everywhere and responsibility for our actions and their consequences. The TOK presentation enables students to act with integrity and honesty.

- Open-minded: TOK Unit 1 encourages students to reflect on their relationship to their own culture and cultures in general through personal and shared knowledge.
- The study of ethics in TOK Unit 1 can be used to examine cultural differences in habits, legislation and moral concepts. This can lead to critical evaluation and acceptance of values and traditions of others. The TOK presentation enables students to show open-mindedness in evaluating a range of points of view.
- Caring: The study of ethics in TOK Unit 1 makes it possible for the students to develop empathy, compassion and respect. This can lead to a commitment to service, and in action to make a positive difference in the lives of others and in the world around us. The TOK presentation enables students to show empathy, compassion and respect.
- Risk-takers (Courageous): TOK Unit 1 encourages students to take risks in their thinking, challenge their own thinking courageously and express their risky ideas to others. The study of ethics in TOK Unit 1 may appear very difficult and even frustrating. TOK Unit 1 aims to face ethical uncertainties with determination and co-

operation with others. The TOK presentation enables the students to challenge their way of thinking and to develop new and innovative strategies. In addition, the TOK presentation can develop resourcefulness and resilience in the future.

- Balanced: TOK Unit 1 covers a wide range of topics. This variety enables the students to explore different aspects of their lives, intellectual, physical and emotional. The TOK presentation enables the students to focus on various aspects of life and to recognize interdependence with other people and with the world in which they live.
- Reflective: TOK Unit 1 is about reflecting on one's ideas about knowledge in general and one's personal knowledge. TOK Unit 1 aims to develop thoughtful consideration toward the world and our own ideas and experience through ethics and the examination of different sciences. The TOK presentation enables the students to thoughtfully consider the world and their own ideas and experience. Moreover, in TOK Unit 1 students can work to understand their strengths and weaknesses in order to support their learning and personal development.

Unit Unit 2 TOK essay

Description

Completing the TOK essay

Essential Understandings

- WOKs: Imagination, Language, Emotion and Faith.
- AOKs: The arts, Religious knowledge systems and Indigenous knowledge systems

Transfer goals

Core

Studying the essential understandings in this Unit and completing the TOK essay includes all ATL skills.

Inquiry questions

- What are Imagination, Language, Emotion and Faith as WOKs?
- What are the arts, religious knowledge systems and indigenous knowledge systems as AOKs?
- What is needed to complete the TOK essay?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: real TOK essay
- Formative: continuous self-assessment and teacher feedback

Learner Profile

- Inquirers: Focus on the arts and religious and indigenous knowledge systems in TOK Unit 3 will foster curiosity and activity in those fields. All this will contribute to lifelong learning. Planning and completing the TOK essay are all about inquiry.
- Knowledgeable: TOK Unit 3 will develop conceptual understanding of the arts and of religious and indigenous knowledge systems. Exploring knowledge across these disciplines will enable the students to engage with issues and ideas that have local and global significance. Students can show their understanding of relevant concepts and understanding through the TOK essay.
- Thinkers: Understanding the basics of the arts and of religious and indigenous knowledge systems in TOK Unit 3 fosters critical

thinking. The TOK essay is a platform to showcase critical thinking skills.

- Communicators: The study of imagination, language, emotion and faith in TOK Unit 3 enables students to express themselves confidently and creatively in various ways. Furthermore, the study of the arts and of religious and indigenous knowledge systems enables students to collaborate effectively, listening carefully to the perspectives of other individuals and groups. The TOK essay enables the students to express themselves confidently and creatively.
- Principled: The study of religious and indigenous knowledge systems in TOK Unit 3 enables students to act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. This leads to taking responsibility for one's actions and their consequences. The TOK essay enables students to act with integrity and honesty.
- Open-minded: The study of the arts and of religious and indigenous knowledge systems in TOK Unit 3 can be used to critically examine and appreciate our own cultures and personal histories, as well as the values and traditions of others. The TOK essay enables students to show open-mindedness in evaluating a range of points of view.
- Caring: The study of the arts and religious and indigenous knowledge systems in TOK Unit 3 makes it possible for the students to develop empathy, compassion and respect. This can lead to a commitment to service, and in acts to make a positive difference in the lives of others and in the world around us. The TOK essay enables students to show empathy, compassion and respect.
- Risk-takers (Courageous): Studying the arts and religious and indigenous knowledge systems in TOK Unit 3 enables the students to approach uncertainty with forethought and determination. TOK provides students with resources and resilience in the face of challenges and change. The TOK essay enables the students to challenge their way of thinking and to develop new and

innovative strategies. In addition, the TOK essay can develop resourcefulness and resilience in the future.

- Balanced: TOK Unit 3 covers a wide range of topics. This variety enables the students to respect different aspects of their lives, intellectual, physical and emotional. The TOK essay enables the students to focus in various aspects of life and to recognize interdependence with other people and with the world in which they live.
- Reflective: TOK Unit 3 aims to develop thoughtful consideration toward the world and our own ideas and experience through the arts and religious and indigenous knowledge systems. Furthermore, TOK Unit 3 can increase the understanding of students' strengths and weaknesses in order to support their learning and personal development. The TOK essay enables the students to thoughtfully consider the world and their own ideas and experience. Moreover, students can work to understand their strengths and weaknesses in order to support their learning and personal development.

SUBJECT GROUP: STUDIES IN LANGUAGE AND LITERATURE

Finnish A Literature, English A Language and Literature

Aims of the subject group

- Introduce students to a range of texts from different periods, styles and genres
- Develop in students the ability to engage in close, detailed analysis of individual texts and make relevant connections
- Develop the students' powers of expression, both in oral and written communication
- Encourage students to recognize the importance of the contexts in which texts are written and received
- Encourage, through the study of texts, an appreciation of the different perspectives of people from other cultures, and how these perspectives construct meaning
- Encourage students to appreciate the formal, stylistic and aesthetic qualities of texts
- Promote in students an enjoyment of, and lifelong interest in, language and literature.

International-mindedness in the subject group

International-mindedness is a natural part of literature (LA1 literature) and media studies (LA1 language and literature). The books studied in LA1 Literature Parts 1 and 4 are chosen from different language areas and possibly from different continents. In our whole school we bring out international issues frequently because our school is a UNESCO school.

In LA1 books are selected that include thematic analysis of cultural encounters. The analysis of novels and plays strengthens young people's capacity for empathy. The same working methods that support international-mindedness are present in the literature analysis of both Language A: language and literature and Language A: literature. The international and societal points of view are strongly present in media studies.

The UN 2030 development goals come up frequently when examining the ethos of poetry (LA 1 Literature) in parts 2 and 3. The selection of poetry in part 3 in itself promotes international-mindedness because the students realize that different people have different points of view.

Whenever there are students present who have a multicultural background this is also taken into account in class discussions. This will provide an excellent base for broadening cultural understanding and the analysis of everyday cultural encounters.

Approaches to teaching within the subject group

Based on inquiry

Inquiry is the foundation for studies in language and literature forming the solid basis for all of the topics covered in both Finnish A1 and English A1 courses. The students are constantly invited to develop their research skills while working on different tasks for either the assessed assignments or as preparation for classroom discussions. We aim to help the students enhance their analytical and perceptual skills by offering them various challenging activities in order to expand their critical thinking both individually and collectively.

Focused on conceptual understanding

All studies in language and literature are closely related to forming ideas and definitions instead of only relying on facts. The students are encouraged to create entities of images, notions and ideas to be able to understand the central themes of all texts examined, both literary and non-literary ones. While paying attention to formal features, we

always support the students in their efforts to expand the range of their skills in abstract reasoning. The student-centred teaching methods employed provide our students with opportunities to share their considerations with others getting instant feedback and material to develop conceptual understanding further.

Developed in local and global contexts

The aim of all language and literature studies is to develop intercultural understanding both locally and globally. As teachers, we want to encourage our students to respect differences and similarities in other people's perspectives in order to create an atmosphere of international-mindedness while acting to affect issues of local importance. When studying texts of a great variety ranging from Finnish novels to international news reporting, and discussing the related background material, the students are provided with skills needed for appreciation of both their own cultures and those of others. The teachers also explore various platforms where cooperation and discussion with national and international colleagues is made possible, and actively participate in any workshops and conferences available in Finland and abroad.

Focused on effective teamwork and collaboration

Teachers work together to plan and create lessons and a curriculum for their students. Each teacher is constantly looking for new teaching methods in order to meet the particular needs of different students in the best possible way. After these ideas have been tried in practice, the experiences are shared between teachers so that everyone can adopt new teaching methods and develop these ideas further, to be shared with other teachers again.

Differentiated to meet the needs of all learners

SEN teacher assists teachers to develop teaching differentiated to meet each student's needs. Students with diagnostic learning difficulties are entitled to inclusive assessment arrangements. Teachers use many different teaching styles and encourage students to find their own individual study methods, assisted by the teacher. Continuous

feedback from students to teachers and vice versa is an important part of this process, aimed at serving each student's specific needs.

Informed by assessment (formative and summative)

Teachers are constantly developing their ways to integrate assessment with teaching to improve student learning and education. Feedback given by IBO after finals, as well as students' final grades, is considered as an important way to see how well the methods used have led to student growth in knowledge, understanding and skills. Students are also frequently asked to give feedback to teachers both orally, in a form of interactive class discussion, and in written form, for example by using the structured INKA survey.

TOK links

- What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?
- To what extent are judgements of aesthetic value absolute, or culturally determined – or both?
- To what extent can literature produce knowledge of human nature or culture?
- How can the quality of literature be assessed and be evaluated as a justification for an interpretation?
- What role does imagination play in a valid interpretation of poems?
- Much of our knowledge comes to us second hand through various forms of media. How sceptical should we be of knowledge claims that we are unable to verify directly?
- Regarding second-hand knowledge claims, is certainty ever possible – or is there always room for scepticism?
- To what extent – if ever – do "the ends justify the means"?
- What is the relationship between art and ethics – if an artwork offends our religious or ethical values, can it nevertheless be good as art? Is the banning of a work of art – good though it may be as art – ever justified on religious ethical grounds?

- What role is played by the various ways of knowing in uncovering bias in knowledge claims encountered in the media?
- To what extent can we talk of objective standards in judging the value of works of art? Is it not simply a matter of personal taste and / or cultural conditioning?
- "Knowledge is power" (Bacon). What roles are played by reason and emotion in the use of language to inform and persuade?
- How is the meaning of a word determined? Is language always and everywhere a purely arbitrary system?
- To what extent might it be true to say that "the limits of my language are the limits of my world"?

CAS links

- School theatre project
- School events
- Media work in the school paper
- School international projects

FINNISH A LITERATURE

Teachers: Laura Hangasmaa, Marja Maaniemi, Raili Kivelä

Aims

- Develop students an understanding of the techniques involved in literary criticism
- Develop the students' ability to form independent literary judgments and to support those ideas.

Assessment objectives

Knowledge and understanding

- Demonstrate knowledge and understanding of individual literary works as representatives of their genre and period, and the relationships between them
- Demonstrate an understanding of the ways in which cultural values are expressed in literature
- Demonstrate awareness of the significance of the context in which a work is written and received
- Substantiate and justify ideas with relevant examples

Analysis, synthesis and evaluation

- Demonstrate an ability to analyse language, structure, technique and style, and evaluate their effects on the reader
- Demonstrate an ability to engage in independent literary criticism on both familiar and unfamiliar literary texts
- Show an ability to examine and discuss in depth the effects of literary techniques and the connections between style and meaning (HL only)

Selection and use of appropriate presentation and language skills

- Demonstrate an ability to express ideas clearly and fluently in both written and oral communication, with an effective choice of register and style
- Demonstrate a command of terminology and concepts appropriate to the study of literature Demonstrate an ability to express well-organized oral and written arguments
- Demonstrate an ability to write a sustained and detailed literary commentary (HL only)

Unit	Unit 1 The art of approaching literary works
Level	Higher Level and Standard Level

Description

The main object of the unit is to prepare students for the Written Assignment process (interactive oral, reflective statement, supervised writing, writing a draft) and individual oral presentation by helping them to understand how literary works (and in the end especially the novels, short stories and plays chosen for part 1, part 2 and part 4) can be approached in many different ways for the thesis or other studies based on literature and by exploring the different world views, values and ideas of human nature that can be found in literary works through analysis.

Essential understandings

The ways in which literary works written in different times and places represent certain culturally and ideologically important issues will be studied by means of critical thinking and analytical method that can be applied both in the field of art and the media. Each student is to develop a deeper understanding of the various processes concerning reading and also writing literature so that they become more able to

apply many different points of view and ideas when searching for meaningful ways of interpreting literary works. Issues to consider: the historical and social context in which the works were written; the narratological and other choices made by the author; how the reader's own standpoint (for example gender, ethnicity, age, social status and so on) affects the reading process; other things that may affect the reception of a literary work). In order to understand literary works one must first understand certain social and psychological issues that can explain human behavior and thinking.

Transfer goals

Students need the sense of context and analytical reading skills in every subject.

Student action

The teacher gives a brief lecture on the history of Western literature and an introduction to analyzing prose and drama in order to ensure that all the students have a certain basic understanding of literature before proceeding further in the syllabus. (The fundamentals of literary analysis have been studied during the pre-DP-courses but at this point it is necessary to deepen the skills of analysis and critical thinking.) Several theses of literature are studied more or less thoroughly as examples of what can be done in the field of literature analysis. Especially the points of view used in a thesis (for example the representation of genders, different minorities or childhood, stylistic features, symbolism), may be enlightening when applied to the works chosen for study in Finnish A.

- Lectures
- Class discussions
- Croup discussions or a project as a team
- Oral and written exercises

Assessment

The teacher evaluates the progress made in the development of the student's skills in the area of analytical and critical thinking on the basis of discussions and oral and written assignments like mock exams. The approaches chosen for Written Assignments are to be discussed with students before proceeding.

Learner profile

The teacher evaluates the progress made in the development of the student's skills in the area of analytical and critical thinking on the basis of discussions and oral and written assignments like mock exams. The approaches chosen for Written Assignments are to be discussed with students before proceeding.

TOK links

- To what extent can literature produce knowledge of human nature or culture?

Unit	Unit 2 The close reading of literary works
Level	Higher Level and Standard Level

Description

Analyzing the passages of prose and poems as they may occur in paper 1. Close reading of literary works in parts 1, 2, 3 and 4.

Essential understanding

To develop all the skills needed in paper 1 and the oral commentary. To became aware of the choices made by the author from small linguistic choices to the themes and representations of various things by learning to think like an author. Realizing that no piece of writing that reflects any aspect of the world can ever be completely

neutral. How to express observations made on the literary works or extracts of them, both orally and in writing, in a clear and well-organized fashion.

Transfer goals

Students acquire an understanding a text's objectivity, or that there are no completely objective texts even in scientific texts in other subjects, but they can estimate the reliability of different texts.

Student action

- Team work
- Class discussions
- Analysis of example texts
- Writing exercises.

Assessment

- Feedback from teacher to students
- Students practise oral commentaries with their phones and give feedback to each other
- The teacher evaluates the progress made in the development of the student's skills in the area of analytical and critical thinking on the basis of discussions and oral and written assignments like mock exams.

Learner profile

This unit has links to all the learner profile attributes but it develops especially critical thinking skills. Discussions develop the student's communicative skills and promote an open-minded attitude to others' opinions.

TOK links

- What kind of evidence can we have to determine the quality of literature?

Unit	Unit 3 Poetry analysis
Level	Higher Level and Standard Level

Description

The nature and significance of the writer's choices in different collections of poetry: stylistic features, topics, tropes, imagery, language, rhythm, themes. How these choices connect different poems of the same literary work (15 or more poems selected from one collection) to each other and what the differences are between different works of poetry. Analysing various paper 2 questions and assessment criteria: how to meet their specific demands.

Essential understandings

Improving students' skills of analysing poetry from different points of view and using different analysis techniques as they are expected to do in the paper 2 exam. Improving students' ability to put themselves into someone else's position by becoming aware of the cultural, historical and social context in which the poems were written, how these contextual circumstances affected an individual of a certain gender, age, social status and so on, and how all this can be seen in literary works and how it all has to be appreciated in analysis.

Student action

- Studying old paper 2 exams and finding different ways of approaching the questions. What can be said about the poems of part 3 when answering paper 2 questions
- Class discussions
- Team work
- Oral and written exercises.

Learner profile

Studies in language and literature: Finnish A literature

This unit is developing students' analytical, thinking and communication skills (inquirers, knowledgeable, thinkers), but also their creativity: the stylistic features of part 3 poems can be studied by writing pastiche poems. Working with poems also encourages the students to be risk-takers, because there are so few pointers to interpretation and they need to learn to talk about alternative points of view.

TOK links

- What role does imagination play in interpreting poetry?

Unit	Unit 4 Oral communication in theory and practice
Level	Higher Level and Standard Level

Description

The specific demands of the individual oral presentation and the individual oral commentary.

Essential understandings

Learning to use formal language in oral communication in order to increase the accuracy of expression and meet the demands concerning the register of speech in certain contexts. Developing presentation and group discussion skills. Conquering stage fright.

Transfer goals

This unit ensures that students can develop their oral communication skills and become able to adapt their behavior to the demands of different communication situations and other subjects.

Assessment

- Self-evaluation

- Feedback from teacher and peers.

Learner profile

This unit mainly develops students' communication skills and reflection skills, but they also learn to show empathy and respect for others while giving feedback to each other.

TOK links

- To what extent might it be true to say that "the limits of my language are the limits of my world"?

Unit	Unit 5 Written communication skills
Level	Higher Level and Standard Level

Descpription

Writing process, academic writing, grammar and spelling, referencing techniques. Analysing examples of different texts. (Paper 1, Paper 2, WA essay process)

Essential understandings

Exercises, class discussions and teachers' lectures ensure that students can develop their written communication skills.

Transfer skills

Students need skills to structure their texts in other subjects too. They learn also the principle of scientific motion and the meaning of academic honestly in the process of planning and writing the WA.

Assessment

- Writing exercises (WA process including 3 reflections, 3 supervised writing; mock exams)

- Feedback from teacher and peers

Learner profile

Principled: the WA process teaches students to act with integrity and honesty. They will be encouraged to reflect on their working methods and the result of their writing process.

TOK links

- To what extent can literature produce knowledge of human nature or culture?

ENGLISH A LANGUAGE AND LITERATURE

Teachers: Maria Valkonen, Zoë Holmila

Aims

- To develop in students an understanding of how language, culture and context determine the ways in which meaning is constructed in texts
- To encourage students to think critically about the different interactions between text, audience and purpose.

Assessment objectives

Knowledge and understanding

- Demonstrate knowledge and understanding of a range of texts
- Demonstrate an understanding of the use of language, structure, technique and style
- Demonstrate a critical understanding of the various ways in which the reader constructs meaning and of how context influences this constructed meaning
- Demonstrate an understanding of how different perspectives influence the reading of a text

Application and analysis

- Demonstrate an ability to choose a text type appropriate to the purpose required
- Demonstrate an ability to use terminology relevant to the various text types studied
- Demonstrate an ability to analyse the effects of language, structure, technique and style on the reader

- Demonstrate an awareness of the ways in which the production and reception of texts contribute to their meanings
- Demonstrate an ability to substantiate and justify ideas with relevant examples

Synthesis and evaluation

- Demonstrate an ability to compare and contrast the formal elements, content and context of texts
- Discuss the different ways in which language and image may be used in a range of texts
- Demonstrate an ability to evaluate conflicting viewpoints within and about a text
- At HL only: Produce a critical response evaluating some aspects of text, context and meaning

Selection and use of appropriate presentation and language skills

- Demonstrate an ability to express ideas clearly and with fluency in both written and oral communication
- Demonstrate an ability to use the oral and written forms of the language, in a range of styles, registers and situations
- Demonstrate an ability to discuss and analyse texts in a focused and logical manner
- At HL only: Demonstrate an ability to write a balanced, comparative analysis

---

Unit	Part 2 Unit 1 Language and mass communication
Level	Higher Level and Standard Level

Description

Part 2 Language and Mass Communication: Use of Persuasive Language, Stereotypes

Essential Understandings

- Ability to examine different forms of communication within the media such as advertising, appeals, opinion pieces and blogs.
- Ability to show an awareness of the potential of the media for ideological influence especially in campaigns and propaganda.

- Ability to show the way mass media use language and image to persuade through use of style and register, forms of bias, layout and use of images and deliberate manipulation of audience.

- Ability to understand the significance of ethical issues concerning gender, age and ethnicity in how language is used in mass communication.

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples of persuasive language within mass communication. Employing the methods and approaches of team-based learning, with constant interaction and debate among team members, will promote their social skills as well as their communication skills.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on provided topics, present their findings to the group and lead discussions based on them. They will share material relating to the topics studied on OneNote: Collaboration Space.

Assessment (summative and formative)

- Summative: Paper 1 Mock examination
- Formative: Peer and Self-evaluation

Learner profile

The contents and related skills of Unit 1 will promote the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while

doing critical media studies), Communicators (while presenting findings and leading as well as participating in discussions), Caring (while considering ethical issues).

TOK links

- Much of our knowledge comes to us second hand through various forms of media. How sceptical should we be of knowledge claims that we are unable to verify directly?
- Regarding second-hand knowledge claims, is certainty ever possible – or is there always room for scepticism?

Unit	Part 2 Unit 2 Language and mass communication
Level	Higher Level

Description

Part 2 Language and Mass Communication: Textual Bias, Media Institutions

Essential Understandings

- Ability to identify and critically evaluate the use of personalization, dramatization, fragmentation and authority-disorder bias especially in news reporting.
- Ability to understand political stances and financial relations within the media focusing on news coverage.
- Ability to show an awareness of the potential for political influence of the media.
- Ability to show the way mass media use language and image to inform through use of style and register, forms of bias, layout and use of images and deliberate manipulation of audience.

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples of textual bias within news coverage. Employing the methods and approaches of team-based learning, with constant interaction and debate among team members, will promote their social skills as well as their communication skills. In Unit 2 the skills of self-management will be encouraged through creating individual learning diaries.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on provided topics, present some of their findings and observations to the group and lead discussions based on them. They will collect material relating to the topics studied on OneNote and include comments in the form of a learning diary.

Assessment (summative and formative)

- Peer and Self-evaluation
- Learning diaries

Learner Profile

The contents and related skills of Unit 2 will promote the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while doing critical media studies), Communicators (while presenting findings and leading as well as participating in discussions), Caring (while considering ethical issues), Reflective (while working on the learning diary).

TOK links

- What role is played by the various ways of knowing in uncovering bias in knowledge claims encountered in the media?

Unit	Part 2 Unit 3 Language and mass communication
Level	Higher Level and Standard Level

Description

Part 2 Language and Mass Communication: Language and Presentation of Speeches and Campaigns, Popular Culture, Arts and Entertainment

Essential Understandings

- Ability to understand and show the way mass media use language and image to inform, persuade and / or entertain.
- Ability to show the way mass media use language and image to inform, persuade and / or entertain through use of style and register, forms of bias, layout and use of images and deliberate manipulation of audience.
- Ability to deliver a coherent Further Oral Activity.

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples and background material for their Further Oral Activities on suggested topics. Employing the methods and approaches of team-based learning will promote their social skills as well as their communication skills with the emphasis on expressing their ideas and information in a clear and structured manner. In Unit 3 the skills of self-management will be encouraged through individual or pair / group work on the Further Oral Activities.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on suggested topics, present their ideas and information to the group and lead discussions and / or other activities, e.g. a survey / poll, based on them. They will share

information and material relating to the topics studied while delivering their Further Oral Activities.

Assessment (summative and formative)

- Summative: Paper 1 Mock examination, Predicted grade on FOA; Written tasks

- Summative and Formative: Teacher Feedback and Assessment of Further Oral Activity, Peer and Self-evaluation (Reflection Form)

Learner Profile

The contents and related skills of Unit 3 will pursue the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while doing critical media studies), Communicators (while presenting findings, ideas and information and leading as well as participating in discussions), Risk-takers (while delivering FOA), Reflective (while working on the Reflection Form).

TOK links

- To what extent can we talk of objective standards in judging the value of works of art? Is it not simply a matter of personal taste and / or cultural conditioning?

Unit	Part 1 Unit 4 Language in cultural context
Level	Higher Level and Standard Level

Description

Part 1 Language in Cultural Context: Language and Knowledge, Language and Power

Essential Understandings

- Ability to analyse how audience and purpose affect the structure and content of texts such as the use of persuasive language in political speeches.
- Ability to demonstrate an awareness of how language and meaning are shaped by culture and context and the ways in which jargon and professional language are used.

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples of professional and / or persuasive language. Employing the methods and approaches of team-based learning, with constant interaction and debate among team members, will promote their social skills as well as their communication skills.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on suggested topics, present their ideas and information to the group and lead discussions and / or other activities, e.g. a survey / poll, based on them. They will share information and material relating to the topics studied while delivering their Further Oral Activity 2.

Assessment (summative and formative)

- Summative: Paper 1 Mock examination, Predicted grade on FOA2
- Summative and Formative: Teacher Feedback and Assessment of Further Oral Activity, Peer and Self-evaluation (Reflection Form)

Learner Profile

The contents and related skills of Unit 4 will promote the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while doing textual analysis), Communicators (while presenting findings,

ideas and information and leading as well as participating in discussions), Risk-takers (while delivering FOA), Reflective (while working on the Reflection Form).

TOK links

- "Knowledge is power" (Bacon). What roles are played by reason and emotion in the use of language to inform and persuade?

Unit	Part 1 Unit 5 Language in cultural context
Level	Higher Level

Description

Part 1 Language in Cultural Context: Language and Communities, Language and Social Relations

Essential Understandings

- Ability to explore how language develops in specific cultural contexts, how it impacts on the world, and how language shapes both individual and group identity.
- Ability to analyse the impact of language changes, e.g. the impact of electronic communication on meaning.
- Ability to explore and understand the emergence of new vocabulary from the language of groups (for example, young people).

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples of the language of different cultural communities. Employing the methods and approaches of team-based learning, with constant interaction and debate among team members, will promote their social skills as well as their communication skills. In Unit 5 the skills of

self-management will be encouraged through creating individual learning diaries.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on provided topics, present some of their findings and observations to the group and lead discussions based on them. They will collect material relating to the topics studied on OneNote and include comments in the form of a learning diary.

Assessment (summative and formative)

- Summative and formative: Peer and Self-evaluation, Learning diaries

Learner Profile

The contents and related skills of Unit 5 will pursue the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while doing textual analysis), Communicators (while presenting findings and leading as well as participating in discussions), Open-minded (while following the language of particular cultural communities), Reflective (while working on the learning diary).

TOK links

- How is the meaning of a word determined? Is language always and everywhere a purely arbitrary system?

Unit	Part 1 Unit 6 Language in cultural context
Level	Higher Level and Standard Level

Description

Studies in language and literature: English A language and literature

Part 1 Language in Cultural Context: Language and the Individual, Translation. Revision of previous units, preparation for the Final Exams, polishing of WT1 and / or WT2 (HL only)

Essential Understandings

- Ability to understand the ways in which language affirms identity and the status given to standard and non-standard forms of the language.
- Ability to analyse and appreciate multilingualism/bilingualism as well as each individual's own personal language profile/identity.
- Ability to identify what is added and what is lost in translation and to consider ethical issues involved.

Transfer goals

Students' research and thinking skills will be enhanced while examining various examples of individual language usage and translation. Employing the methods and approaches of team-based learning, with constant interaction and debate among team members, will promote their social skills as well as their communication skills.

Student Action

According to the principles of team-based learning, students will conduct inquiry and research on provided topics, present some of their findings and observations to the group and lead discussions based on them. They will collect material relating to the topics studied on OneNote and include a personal language profile in note or chart form.

Assessment (summative and formative)

- Summative: Paper 1 Mock examination; Written tasks
- Formative: Peer and Self-evaluation

Learner Profile

The contents and related skills of Unit 6 will promote the development of the following attributes of the IB Learner profile: Inquirers (while doing research), Knowledgeable (while finding examples), Thinkers (while doing textual analysis), Communicators (while presenting findings and leading as well as participating in discussions), Open-minded (while exploring language of the individuals), Reflective (while creating their own individual language profiles).

TOK links

- To what extent might it be true to say that "the limits of my language are the limits of my world"?

Unit	Part 3 Unit 1 Texts and contexts
Level	Higher Level and Standard Level

Description

The unit functions as an introduction to literary studies through a close reading and a detailed comparison of two contrasting short stories ("Signs and Symbols" by Vladimir Nabokov and "The Brain Goes Home" by Damon Runyon).

Essential understandings

Students will learn what to look for when reading a literary work; they will acquire an understanding of the vocabulary required to describe a literary work in terms of its setting, structure, characterization, style, tone, narrative technique; and in terms of the attitudes to race, gender, and social class that inform it. They will learn how to plan and write a literary essay.

Transfer goals

Essay planning and writing are necessary skills in all DP subjects and in Theory of Knowledge.

Student action

Students will read the two stories in class with guidance and comment from the teacher; they will re-read them in their own time; they will discuss the stories under the various headings listed above; they will plan and write a comparative essay; when the essay is returned it will be accompanied by a specimen essay written by the teacher which they will study as an example.

Assessment (summative and formative)

- Formative: practice essay assessed by the teacher
- Summative: paper 2 mock examination

Learner profile

Inquirers/Knowledgeable: students will be introduced to cultures and lifestyles widely different from their own. Thinkers: the unit fosters critical and creative thinking skills in describing and analysing literary texts.

TOK links

What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?

Unit	Part 3 Unit 2 Texts and contexts
Level	Higher Level and Standard Level

Description

Part 3 (Texts in Context): Alexandr Solzhenitsyn, One Day in the Life of Ivan Denisovich

Essential understandings

Text of the novel; its context of production (the "thaw" in Soviet domestic policy in the early 1960s under Khrushchev); its context of reception both in the Soviet Union and the West.

Transfer goals

Essay planning and writing are necessary skills in all DP subjects and in Theory of Knowledge. In addition, the historical setting of the novel's action – the GULAG system under Stalin – is relevant to the students' History syllabus; and the behavior of the prisoners and the guards within the system may have relevance to their studies in Psychology.

Student action

Students will read through the novel in class with guidance and comment by the teacher on tone, style and narrative technique; they will take part in class discussion on these topics. They will re-read the novel in their own time, familiarizing themselves with its events, characters and so on; and study the materials assembled on peda.net regarding the novel's context of production and reception. They will write a practice essay on the theme of justice in One Day and Things Fall Apart; when the essay is returned it will be accompanied by a specimen essay written by the teacher which they will study as an example.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities; practice essay
- Summative: mock exam paper 2; (possibly) written tasks 1 and 2

Learner Profile

Reflective: students are encouraged to reflect on the historical background to the novel and ask themselves if such a system could ever arise in their own country – and how they themselves would react if it did.

TOK links

What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?

Unit	Part 3 Unit 3 Texts and contexts
Level	Higher Level and Standard Level

Description

Part 3 (Texts in Context): Chinua Achebe, Things Fall Apart

Essential understandings

Text of the novel; its contexts of production and reception.

Transfer goals

Essay planning and writing are necessary skills in all DP subjects and in Theory of Knowledge. In addition, the historical setting of the novel's action – the colonization of Africa by Europeans – is relevant to the students' History syllabus.

Student action

Students will read through the novel in class with guidance and comment by the teacher on tone, style and narrative technique; they will take part in class discussion on these topics. They will re-read the novel in their own time, familiarizing themselves with its events, characters and so on; and study the materials assembled on peda.net regarding the novel's context of production and reception. They will write a practice essay on the theme of justice in One Day and Things Fall Apart; when the essay is returned it will be accompanied by a

specimen essay written by the teacher which they will study as an example.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities; practice essay
- Summative: mock exam paper 2; (possibly) written tasks 1 and 2

Learner Profile

Open-minded/Reflective: students are encouraged to reflect on the clash of cultures central to the novel and to consider questions of moral relativism – to ask themselves whether there are such things as absolute moral values against which cultures may be judged and found to be better or worse than one another.

TOK links

- What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?
- To what extent are ethical values absolute, or culturally determined – or both?

Unit	Part 3 Unit 4 Texts and contexts
Level	Higher Level

Description

Part 3 (Texts in Context): Graham Greene, The Quiet American

Essential understandings

Text of the novel; its context of production (Greene's experience of the war in Indo-China in the early 1950s); its context of reception both in the USA and elsewhere.

Transfer goals

Essay planning and writing are necessary skills in all DP subjects and in Theory of Knowledge. In addition, the historical setting of the novel's action – the First Indo-China War – is of clear relevance to the students' Global Politics syllabus.

Student action

Students will read through the novel in class with guidance and comment by the teacher on tone, style and narrative technique; they will take part in class discussion on these topics. They will re-read the novel in their own time, familiarizing themselves with its events, characters and so on; and study the materials assembled on peda.net regarding the novel's context of production and reception.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities
- Summative: mock exam paper 2; (possibly) written tasks 1 and 2

Learner profile

Open-minded/Reflective: students are encouraged to reflect on the moral dilemmas central to the novel and to consider ethical questions – to ask themselves whether "good" ends can ever justify the use of "bad" means.

TOK links

- What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?
- To what extent – if ever – do "the ends justify the means"?

-

Unit	Part 4 Unit 5 Texts: critical study
Level	Higher Level and Standard Level

Description

Part 4 (Texts – critical study): Saul Bellow, Seize the Day

Essential understandings

Text of the novel; how to describe its tone, style, characters, narrative technique and so on as evidenced in short extracts

Transfer goals

Planning and (clear and confident) delivering of oral presentations are necessary skills in all DP subjects and in Theory of Knowledge.

Student action

Students will read through the novel in class with guidance and comment by the teacher on tone, style and narrative technique; they will take part in class discussion on these topics. They will re-read the novel in their own time, familiarizing themselves with its events, characters and so on; and study the materials assembled on peda.net regarding the novel.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities; practice oral commentary
- Summative: Individual Oral Commentary; (possibly) written tasks 1 and 2

Learner Profile

Thinkers/Communicators: students exercise critical and creative thinking in preparing their IOCs and communicative skills in delivering them.

TOK links
What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?

Unit	Part 4 Unit 6 Texts: critical study
Level	Higher Level and Standard Level

Description
Part 4 (Texts – critical study): William Shakespeare, The Merchant of Venice

Essential understandings
Text of the play; how to describe its tone, style, characters, formal aspects and so on as evidenced in short extracts

Transfer goals
Planning and (clear and confident) delivering of oral presentations are necessary skills in all DP subjects and in Theory of Knowledge.

Student action
Students will view the play scene by scene in class with guidance and comment by the teacher on tone, style, characterization and form; they will take part in class discussion on these topics. They will re-read the play in their own time, familiarizing themselves with its events,

characters and language; and study the materials assembled on peda.net regarding the play.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities; practice oral commentary
- Summative: Individual Oral Commentary; (possibly) written tasks 1 and 2

Learner profile

Thinkers/Communicators: students exercise critical and creative thinking in preparing their IOCs and communicative skills in delivering them.

TOK links

- What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?
- What is the relationship between art and ethics – if an artwork offends our ethical values, can it nevertheless be good as art?

Unit	Part 4 Unit 7 Texts: critical study
Level	Higher Level

Description

Part 4 (Texts – critical study): Anthony Burgess, A Clockwork Orange

Essential understandings

Text of the novel; how to describe its tone, style, characters, narrative technique and so on as evidenced in short extracts

Transfer goals

Planning and (clear and confident) delivering of oral presentations are necessary skills in all DP subjects and in Theory of Knowledge.

Student action

Students will read through the novel in class with guidance and comment by the teacher on themes, tone, style and narrative technique; they will take part in class discussion on these topics. They will re-read the novel in their own time, familiarizing themselves with its events, characters and so on; and study the materials assembled on peda.net regarding the novel.

Assessment (summative and formative)

- Formative: continuous assessment of students' contribution to class activities; practice oral commentary
- Summative: Individual Oral Commentary; (possibly) written tasks 1 and 2

Learner Profile

Thinkers/Communicators: students exercise critical and creative thinking in preparing their IOCs and communicative skills in delivering them.

TOK links

- What is the nature of the knowledge that we acquire from studying the arts, and literature in particular? What differences and similarities are there between such knowledge and that gained from other AoKs – history, human sciences, ethics?
- Is the banning of a work of art – good though it may be as art – ever justified on ethical grounds?

SUBJECT GROUP: LANGUAGE ACQUISITION

French ab initio

Aims of the subject group

1. Develop international-mindedness through the study of languages, cultures, and ideas and issues of global significance.
2. Enable students to communicate in the language they have studied in a range of contexts and for a variety of purposes.
3. Encourage, through the study of texts and through social interaction, an awareness and appreciation of a variety of perspectives of people from diverse cultures.
4. Develop students' understanding of the relationship between the languages and cultures with which they are familiar.
5. Develop students' awareness of the importance of language in relation to other areas of knowledge.
6. Provide students, through language learning and the process of inquiry, with opportunities for intellectual engagement and the development of critical- and creative-thinking skills.
7. Provide students with a basis for further study, work and leisure through the use of an additional language.
8. Foster curiosity, creativity and a lifelong enjoyment of language learning.

Assessment objectives

1. Communicate clearly and effectively in a range of contexts and for a variety of purposes.

2. Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences.
3. Understand and use language to express and respond to a range of ideas with fluency and accuracy.
4. Identify, organize and present ideas on a range of topics.
5. Understand, analyse and reflect upon a range of written, audio, visual and audio-visual texts.

CAS links

- Taking part in European Youth Parliament sessions
- School projects concerning global citizenship
- Volunteer work in Multicultural Center Gloria
- Organizing theme days in the school
- Organizing an international theme day called Global Village
- International student exchanges organized by the school
- Each one – Teach one (teaching and learning a language with a person from another culture)
- Tutoring/guiding international students/guests

FRENCH AB INITIO

Teachers Marina Spatafora, Taija Ylönen

At the language ab initio level, a student develops receptive, productive and interactive communicative skills. Students learn to communicate in the target language in familiar and unfamiliar contexts.

- Receptive: Students understand, both aurally and in writing, simple sentences and some more complex sentences relating to the five prescribed themes and related topics. They understand simple authentic and adapted written and audio texts and related questions in the target language.
- Productive: Students express information fairly accurately, in both writing and in speech, using a range of basic vocabulary and grammatical structures. They communicate orally and respond appropriately to most questions on the five prescribed themes and related topics.
- Interactive: Students understand and respond clearly to some information and ideas within the range of the five prescribed themes and related topics. They engage in simple conversations. They use strategies to negotiate meaning and foster communication.

(Source: IBDP Language acquisition guide)

Unit	Unit 1
Level	Standard Level

Essential understandings

The students will be able to describe their personal attributes and preferences. They can talk about their family, friends, living conditions and daily routines. They will also be able to describe the basic features of their native culture while comparing differences and similarities between their own customs and traditions, and cultures related to the target language. The students will learn where the target language is spoken and discuss its global and social role.

Themes and topics

- Identities
  - personal attributes, personal relationships
- Experiences
  - daily routine, leisure, festivals and celebrations
- Social organization
  - social issues

Transfer goals

The students learn to initiate communication with other people. Awareness of cultural differences promotes students' ability to approach new interactive situations with an understanding of possible difficulties they might encounter and that could lead to misunderstandings.

Student action in the unit

- Writing a profile on a social media forum
- Family tree
- Pair/group work
- Letter/email/postcard
- Journal (daily routines)

Assessment

Formative assessment is continuous during the course. In addition to teacher feedback, peer and self-evaluation play an important role in this. One possible tool for comparing self-assessment and the assessment teacher has given exists in our school intranet Wilma. Summative assessment can comprise different kinds of oral and written tests. The students will conduct appropriate parts of past Papers 1 and 2 including oral and listening comprehension tests.

Learner profile

The students reflect their identity in relation to the speakers of other languages. Their international- mindedness will be in focus as well as open-minded and caring attitude.

TOK links

- To what extent do our personal attributes influence our personal and shared knowledge?
- Under what circumstances can daily routines, customs and habits hinder acquiring knowledge?

Unit	Unit 2
Level	Standard Level

Essential understandings

The students will be able to discuss issues related to health, well-being and personal relationships in different stages of life. They practise describing their daily routines, and evaluate them especially from the point of view of a healthy diet, adequate sleep and regular exercise. The role of modern technologies and digitalisation in promoting well-being will be studied.

Themes and topics

- Identities

    - physical well-being, personal relationships, eating and drinking
- Experiences
    - daily routine
- Human ingenuity
    - technology

Transfer goals

The students will understand that there are differences in meal times and the role of eating and drinking in different cultures. The students will be able to evaluate the effects of different choices they make concerning their diet or exercise routines, which promotes their self-management skills.

Student action

- Instructions for a healthy lifestyle
- Recipes
- Blogs, diaries
- Dialogues eg. doctor-patient

Assessment

Formative assessment is continuous during the course. In addition to teacher feedback, peer and self-evaluation play an important role in this. One possible tool for comparing self-assessment and the assessment teacher has given exists in our school intranet Wilma. Summative assessment can comprise different kinds of oral and written tests. The students will conduct appropriate parts of past Papers 1 and 2 including oral and listening comprehension tests.

Learner profile

The students will reflect critically on a balanced conception of life. Inquiry based learning can be used to find out about facts that promote a healthy life style.

TOK links

How can we justify dietary guidelines based on religious knowledge systems?

Can aesthetic standards be justified by either reason or emotion?

Unit	Unit 3
Level	Standard Level

Essential understandings

The students will learn about different cultural phenomena in the target language countries. Material for the course will cover traditionally valued areas of culture such as literature, arts, theatre, music and film but also contemporary popular culture is studied. The students will look for information from different media and evaluate their credibility.

Themes and topics

- Experiences
  - leisure, festivals and celebrations
- Human ingenuity
  - entertainment
  - the media

Transfer goals

The students will be able to appreciate, interpret and review cultural products as reflections of a certain time period and socio-political background. They will also be critical in their attitudes towards different media.

Student action

- Reviews
- Presentations
- Blogs, diaries
- Interview
- Poster/brochure
- Recommendation
- Planning a museum visit/cultural tour

Assessment

Formative assessment is continuous during the course. In addition to teacher feedback, peer and self-evaluation play an important role in this. One possible tool for comparing self-assessment and the assessment teacher has given exists in our school intranet Wilma. Summative assessment can comprise different kinds of oral and written tests. The students will conduct appropriate parts of past Papers 1 and 2 including oral and listening comprehension tests.

Learner profile

The critical and reflective thinking is present as well as an open-minded approach to cultural life in both countries. The knowledge of different kind of concepts in arts and life will increase. The students also learn to communicate better and defend their opinions.

TOK links

- To what extent is piece of artwork a reliable way to gain knowledge about different cultures?
- Is entertainment a valid way of gaining knowledge?

Unit	Unit 4
Level	Standard Level

Essential understandings

The students will look for information about studying and working in the target language countries. They learn vocabulary related to studies, professions and working life. They will discuss their future plans and practise skills needed in applying for a study place or a job. They will also think about the qualities appreciated in the future working life.

Themes and topics

- Social organization
    - education
    - the workplace
    - social issues

Transfer goals

Skills required in applying for a job are similar regardless of the language. The students learn how to use both written and spoken language in more formal situations. They will be able to find different kinds of sources from which to get knowledge about studying after high school and about working in different professions and about the facts of working life.

Student action

- Curriculum vitae
- Formal letter
- Job interview
- Announcements

Assessment

Formative assessment is continuous during the course. In addition to teacher feedback, peer and self-evaluation play an important role in this. One possible tool for comparing self-assessment and the assessment teacher has given exists in our school intranet Wilma. Summative assessment can comprise different kinds of oral and written tests. The students will conduct appropriate parts of past Papers 1 and 2 including oral and listening comprehension tests.

Learner profile

The students will develop skills for inquiry and research. They will also explore knowledge across a range of disciplines and engage their ideas that have local and global significance. They will use critical, creative and reflective thinking by
making reasoned and ethical decisions. Their communication skills increase as well.

TOK links

- How does education shape our personal knowledge?
- What role does intuition play in acquiring knowledge about job applicants?

Unit	Unit 5
Level	Standard Level

Essential Understandings

The main concern of the course is global issues, the emphasis being on the environment and sustainable development, especially from the point of view of an individual student's capacity to make a difference. Everyday choices will be discussed and compared, and their impact on the future of our planet studied.

Themes and topics

- Sharing the planet
  - climate
  - physical geography
  - the environment
  - global issues

Transfer goals

The students will be able to understand how fragile nature and the environment are and how an individual can live without destroying the climate and the life on our planet. They get the vocabulary to work on these issues and discuss the subject with people from the target language countries. The students will also be able to write informative texts and to speak about the subject in an argumentative way.

Student action

- Survey/opinion poll
- Report
- Article
- Letter to the editor
- Debate
- Weather maps/forecasts
- News broadcasts

Assessment

Formative assessment is continuous during the course. In addition to teacher feedback, peer and self-evaluation play an important role in this. One possible tool for comparing self-assessment and the assessment teacher has given exists in our school intranet Wilma. Summative assessment can comprise different kinds of oral and written tests. The students will conduct appropriate parts of past Papers 1 and 2 including oral and listening comprehension tests.

Learner profile

The students will use inquiry and research skills and they will develop innovative ideas by using critical and reflective thinking. They act with a strong sense of fairness and justice. They have a respect for the dignity and rights of people. They are aware of their own actions and their consequences.

TOK links

- To what extent can we influence the shared knowledge concerning climate change?

SUBJECT GROUP: INDIVIDUALS AND SOCIETIES

Economics, Global Politics, History, Psychology, Environmental Systems and Societies (see Subject Group: Sciences)

Aims of the subject group

- Encourage the systematic and critical study of human experience and behaviour; physical, economic and social environments; and the history and development of social and cultural institutions
- Develop in the student the capacity to identify, to analyse critically and to evaluate theories, concepts and arguments about the nature and activities of the individual and society
- Enable the student to collect, describe and analyse data used in studies, to test hypotheses, and to interpret complex data and source material
- Promote the appreciation of the way in which learning is relevant both to the culture in which the student lives, and to the culture of other societies
- Develop an awareness in the student that human attitudes and beliefs are widely diverse and that the study of society requires an appreciation of such diversity
- Enable the student to recognize that the content and methodologies of the subjects in group 3 are contestable and that their study requires the tolerance of uncertainty

International-mindedness in the subject group

Individuals and societies subjects seek to develop international understanding and foster a concern for global issues, as well as to raise students' awareness of their own responsibility at a local and national level. The key element in the teaching in Individuals and Societies subject group is the use of wide range of sources and the bidirectional relationship between individual and society. International-mindedness is explicitly integrated to the syllabi and teachers support the students' understanding by introducing global challenges facing the world today as well as links from them to local events and phenomena. Students are encouraged to acknowledge different perspectives and to engage in respectful dialogue about them. Values and attitudes are evaluated in different contexts.

The Individuals and Societies subject group is active in co-operation with international partners such as participation in EYP Finland and school study trips (examples of previous projects are Wales, Russia and France).

Approaches to teaching within the subject group

Based on inquiry

The key aspect in teaching Individuals and Societies' subjects is promotion of thinking skills. Students are taught critical use of sources and encouraged to search for them themselves. Teachers guide to context-sensitivity and to learn about different perspectives. Students are also encouraged to formulate their own research questions, especially towards the end of their studies. Students not only learn theories but also to appropriately apply them to real-life cases and to be aware of their strengths and limitations. In classes, both quantitative and qualitative data is used, applied and evaluated critically. The ethical dimensions involved in the application of theories and policies permeate throughout the courses as students are required to consider and reflect on human end-goals and values.

Focused on conceptual understanding

Each subject it taught via key concepts which are used as a lens through which to analyse the cases emphasizing a demonstration of conceptual understanding. It allows students to make connections between the different areas of the syllabus using concepts, case studies or real-world issues. The key concepts deepen students' understanding of content and encompass different values and recommend different practices when approached from different theoretica, cultural and individual perspectives. Conceptual understanding is open to alternative interpretations. Teachers also emphasize understanding and appreciating academic tradition and discipline literacy in their teaching.

Developed in local and global contexts

Different levels of analysis are used to offer students both the global and local viewpoint on topics. Students' are encouraged to use and share their previous experiences to give context especially to the more theoretical topics. Students' everyday life and modern phenomena are examined from the viewpoint of social studies and historical events.

Focused on effective teamwork and collaboration

The teaching and learning are largely based on class discussions and debates in all subjects. Dialogic approach to teaching allows the student's prior knowledge to be appreciated and new knowledge build on the already existing one. In class discussions, students practice now only argumentation but also respectful listening of others and appreciating their points of views.

Both teacher and student collaboration are encouraged throughout courses of study. Teachers actively use group projects and even more long-term teamwork in their teaching. Teachers recognize shared concepts and phenomena in their subjects and build bridges in order to help students to see links between subjects.

Differentiated to meet the needs of all learners

The class assignments are typically open-ended, where students have the possibility to adjust the task according to their prior knowledge and

skill level. Teachers assist students in recognizing and evaluating their level and need for practice. Additional support is offered in form of micro lessons for students who need it.

Students who need additional help, work in close cooperation with the school SEN teacher and class activities are differentiated in many ways to support learning. For example, students are allowed to leave the classroom when working independently and they are allowed to do written exams in separate rooms.

Teachers have additional material for more advanced students to make sure they also get the academic challenge. Teachers discuss with students their target grades and encourage students to reach and even go beyond them. Even the high achieving students have the right to know their limits and how to improve their skills and increase their knowledge.

Informed by assessment (formative and summative)
The assessment in each subject is based on continuous formative assessment. Self-assessment and reflection are key parts of learning and used throughout the studies. In addition, assignments are peer-assessed when appropriate. Each student has the right to receive guiding feedback on their skills and progress. Even the high-achieving students are entitled to know their limits, therefore effective assessment is for all students.

The assessment criteria are always explained to the students in the beginning of the course and they are based on IB assessment criteria. Digital platforms are efficiently used in communicating the assessment and when communicating the grades to students and legal guardians, data protection is ensured by the use of school's data protected information channel.

TOK links

- To what extent can we gain knowledge about the future by using intuition?

- Under what circumstances is it justifiable to quantify human behaviour?
- What role does language play in justifying different interpretations about the past?
- To what extent is reasoning based on assumptions a reliable way to gain knowledge?
- How far is it possible to use emotion in validating ethical choices in pursuing knowledge?

CAS links

Examples of Individuals and Societies inspired CAS experiences and projects:

- Taking part in European Youth Parliament Sessions
- Participating in local Youth Council
- School projects concerning global citizenship
- School debate club
- Volunteer work in multicultural center Gloria
- Organizing theme days in the school
- Organizating international theme day Global Village

Promoting research skills in the subject group

- Using scientific research papers and journal articles in learning
- Research workshops
- Promoting critical thinking by following topical news events and evaluating them
- Awareness of choices made when choosing quantitative indicators
- Balanced argumentation (claims and counterclaims)
- Creating research questions on their own

ECONOMICS

Teachers: Petteri Mäkelä

The study of economics is essentially about dealing with scarcity, resource allocation and the methods and processes by which choices are made in the satisfaction of unlimited human needs and aspirations. As a social science, economics uses scientific methodologies that include quantitative and qualitative elements. The economics course emphasizes the economic theories of microeconomics, which deal with economic variables affecting individuals, firms and markets, and the economic theories of macroeconomics, which deal with economic variables affecting countries, governments and societies. These economic theories are not to be studied in a vacuum—rather, they are to be applied to real-world issues. Internal assessment, the Economics portfolio, enables students to demonstrate the application of their knowledge and understanding of economic theory to real-world situations.

The aims of the IBDP Economic syllabus:

- Develop an understanding of microeconomic and macroeconomic theories and concepts and their real-world application
- Develop an appreciation of the impact on individuals and societies of economic interactions between nations
- Develop an awareness of development issues facing nations as they undergo the process of change.

Key concepts

- Economics as social science

    - Explain that economics is a social science.
    - Outline the social scientific method.
    - Explain the process of model building in economics.
    - Explain that economists must use the ceteris paribus assumption when developing economic models.
    - Distinguish between positive and normative economics.
    - Examine the assumption of rational economic decision-making.
- Scarcity
    - Explain that scarcity exists because factors of production are finite and wants are infinite.
    - Explain that economics studies the ways in which resources are allocated to meet needs and wants.
    - Explain that the three basic economic questions that must be answered by any economic system are: "What to produce?", "How to produce?" and "For whom to produce?"
- Choice
    - Explain that as a result of scarcity, choices must be made.
- Opportunity cost
    - Explain that when an economic choice is made, an alternative is always foregone.

Central themes

- The extent to which governments should intervene in the allocation of resources
- The threat to sustainability as a result of the current patterns of resource allocation
- The extent to which the goal of economic efficiency may conflict with the goal of equity
- The distinction between economic growth and economic development.

Unit	Unit 1: Microeconomics
Level	Higher Level and Standard Level

Description

The unit introduces the basics of economics both as academic discipline and an IBDP subject. The basic microeconomic theories are introduced, applied and used in analysis and evaluation.

Essential understandings

- The student understands how markets work when prices act as signals and incentives
- The student understands market efficiency and how it's reached in the competitive market equilibrium
- The student understands and is able to evaluate the effects of the responsiveness of demand or supply to different non-price determinants.
- The student understands market failures and possible government interventions in them
- The student is able to analyse and evaluate different government responses and how they affect different stakeholders

Transfer goals

- The student learns how to use economic thinking in analysis and decision-making in different aspects of life.
- The student understands correlations and causalities when they occur and also doubt when they seem to occur.
- The student is able to do cost-benefit analysis which will include all costs, not only the explicit costs.
- The student understands the role of assumptions in arguments
- The student is able to propose solutions to problems that do not have a clear answer and argue them effectively
- The student understands the "ceteris paribus" assumption and its significance in argumentation.
- The student acknowledges different choices even when disagreeing with them.
- The student is able to argue a personal opinion by balanced evaluation of different arguments.

Student action

- Use of topical news worldwide (thinking skills)
- Class discussions (social skills, communication skills)

- Essays in which students are required to communicate effectively in written and graphical form about specific economic issues. (communication skills, self-management skills)
- Questioning one's own assumptions and biases by looking at topical economic or political problems (thinking skills)
- Possible case example: The price elasticity of demand for speeding (research skills)
- Possible case example: "Sin taxes" (thinking skills)
- SL students conduct first commentary for the Economics portfolio, HL students conduct either form Unit 1 or Unit 2.

Assessment

- Students are formatively assessed throughout the unit by written and oral feedback
- Standard Level students conduct their first commentary for the Economics portfolio and are assessed by the IB criteria, if appropriate to the class timetables.
- Standard Level students conduct Paper 1 and are assessed by IB criteria as appropriate
- Higher Level students conduct both Paper 1 and Paper 3 and are assessed by IB criteria as appropriate

Learner profile

Discussing the impact of our actions on others (principled)

TOK links

- To what extent are the media a reliable way of acquiring information concerning society?
- To what extent can human behaviour be explained by quantitative methods?

Unit	Unit 2: Microeconomics; Theory of Firm and Market Structure
Level	Higher Level

Description

In this unit, number of theories are presented to examine the behaviour of firms and hence giving more light to the nature of supply.

Essential understandings

- The student understands the contexts of production, costs, revenue and profit when analysing firm behaviour.
- The student is able to analyse both short-run and long-run outcomes of firm behaviour
- The student is able to analyse the interdependence of different stakeholders
- The student is able to analyse how prices are formed in different market structures
- The student is able to analyse the outcomes of different goals of firms.
- The student is able to compare and contrast different market structures by their allocative and productive efficiency and market outcomes
- The student is able to recognize price discrimination and evaluate the consequences of it

Transfer goals

- The student understands the distinction between short-run and long-run in decision-making
- The student has the ability understand the significance and take into consideration the implicit costs as well as explicit
- The student understands the interdependence of different stakeholders in decision-making.
- The student is able to propose solutions to problems that do not have a clear answer.

Student action

- Use of topical news worldwide (thinking skills)
- Class discussions (social skills, communication skills)
- Essays in which students are required to communicate effectively in written and graphical form about specific economic issues. (communication skills, self-management skills)

- Questioning one's own assumptions and biases by looking at topical economic or political problems (thinking skills)
- Possible case: The alcohol monopoly and recent legislation changes in Finland (research skills)
- Possible case: Strategy games; game theory (thinking skills, social skills)
- HL students conduct the first commentary for Economics portfolio either form Unit 1 or Unit 2.

Assessment

- Students are formatively assessed throughout the unit by written and oral feedback
- Higher Level students conduct their first commentary for the Economics portfolio and are assessed by the IB criteria
- Higher Level students conduct both Paper 1 and Paper 3 and are assessed by the IB criteria as appropriate

Learner profile

Decision-making in different aspects of life as interdependent actions (balanced)

TOK links

- To what extent are purely theoretical models useful in gaining knowledge about society?
- What evidence do we have to justify that firms value ethical considerations in their decision-making?

Unit	Unit 3: Macroeconomics
Level	Higher Level and Standard Level

Description

This unit examines the behaviour and performance of the economy as a whole.

Essential understandings

- The student understands the economic and social costs of inflation, unemployment, low levels of economic growth and rising levels of income inequality and how to measure them.
- The student can evaluate the costs and benefits of economic growth.
- The student understands and can compare and contrast the Keynesian vs. the neo-classical school of economic thought.
- The student understands how to measure well-being and is able to critically evaluate different approaches.
- The student is able to evaluate different policies and their efficiency in achieving macroeconomic goals.
- The student is able to discuss the relationship between sustainability and economic growth.

Transfer goals

- Light government vs. strong government; understanding different perspectives on how equity is achieved when governing a state.
- Understanding trade-offs on the level of a whole economy
- Knowing how to locate and use primary data sources
- Compare and contrast two or more arguments that have different conclusions to a specific issue or problem.
- Understanding that "equity" may be understood in different ways.
- Proposing solutions to problems that do not have a clear answer.
- Understanding how economically sound and ethical political decisions are made and evaluating them.
- Being able to critically assess economic growth
- Understanding the difference between correlation and causality

Student action

- Use of topical news (thinking skills)
- Class discussions (social skills, communication skills)
- Obtaining data and analysing it (research skills)
- Essays in which students are required to communicate effectively in written and graphical form about specific economic issues. (Communication skills, self-management skills)

- Case example: Problems with different ways of defining and measuring well-being (thinking skills, research skills)
- Students conduct their second commentary for Economics portfolio

Assessment

- Students are formatively assessed throughout the unit by written and oral feedback
- Both Higher Level and Standard Level students conduct their second commentary for the Economics portfolio and are assessed by the IB criteria
- Standard Level students conduct Paper 1 and are assessed by the IB criteria as appropriate
- Higher Level students conduct both Paper 1 and Paper 3 and are assessed by the IB criteria as appropriate

Learner profile

Discussing and appreciating different political views (communicators, open-minded)

TOK links

- To what extent can we use historical data for empirical evidence for the existence of the business cycle?
- Under what circumstances can we forecast the economy?
- To what extent can we justify political decisions based on emotions?

Unit	Unit 4: International Economics
Level	Higher Level and Standard Level

Description

This unit examines consumers, producers and governments operating in an open economy.

Essential understandings

- Understanding and analysing the benefits and problems of both free trade and trade barriers
- Understanding comparative and absolute advantage and their significance in trade patterns.
- Understanding how the foreign exchange market works and the possibilities of government intervention.
- Understanding the structure of the balance of payments and being able to evaluate the causes and consequences of surpluses and deficits of different components.
- The student is able to evaluate different types of economic integration and their impact on societies and individuals.
- The student understands the causes and consequences of changes in terms of trade (HL only)

Transfer goals

- Understanding that countries are in different stages in their economic wellbeing and therefore policies should be evaluated accordingly
- Being able to acknowledge multiple consequences of a certain policy or trade pattern.
- Understanding the links between the domestic and the global economy.
- Understanding global responsibility on sustainability.

Student action

- Use of topical news (thinking skills)
- Class discussions (social skills, communication skills)
- Obtaining data and analyzing it (research skills)
- Essays in which students are required to communicate effectively in written and graphical form about specific economic issues. (Communication skills, Self-management skills)
- Students conduct their third commentary for the Economics portfolio

Assessment

- Students are formatively assessed throughout the unit by written and oral feedback.

- Both Higher Level and Standard Level students conduct their third commentary for the Economics portfolio and are assessed by the IB criteria.
- Standard Level students conduct Paper 2 and are assessed by the IB criteria as appropriate.
- Higher Level students conduct both Paper 2 and Paper 3 and are assessed by the IB criteria as appropriate.

Learner profile

Researching global political, economic and social phenomena (open-minded)

TOK links

- What role does faith play in international policy making?
- Under what circumstances is language a barrier to the knowledge we need for global integration?

Unit	Unit 5: Development Economics
Level	Higher Level and Standard Level

Description

This unit examines the connection between economic growth and economic development shedding light to less developed economies in more detail.

Essential understandings

- Understanding the nature of economic growth and economic development and their interdependence.
- Understanding the ways of measuring economic development and the use of different indicators.
- Understanding the differences and similarities of less developed countries
- Understanding and evaluating different factors contributing to economic development.

- Understanding and evaluating global interdependence on economic development.
- Evaluating different policies in promoting economic development.

Transfer goals

- The student is able to critically assess and evaluate different welfare indicators.
- The student is able to consider ethical aspects of economic decisions.
- The student can make a difference between and evaluate short-run and long-run consequences.

Student action

- Use of topical news (thinking skills)
- Discussions (social skills, communication skills)
- Use and evaluation of comparative data (research skills, thinking skills)
- Essays in which students are required to communicate effectively in written and graphical form about specific economic issues. (Communication skills, Self-management skills)
- Both Higher Level and Standard Level students are allowed to conduct a fourth news commentary if the student and the teacher find it useful.

Assessment

Students are formatively assessed throughout the unit by written and oral feedback

Learner profile

Appreciation of different approaches to a meaningful and satisfactory life (open-minded)
Encouraging shared responsibility on global development (caring)

TOK links

- What role can ethical and ideological principles play in acquiring knowledge about satisfactory life?
- To what extent can we trust quantitative indicators in determining the level of living standards?

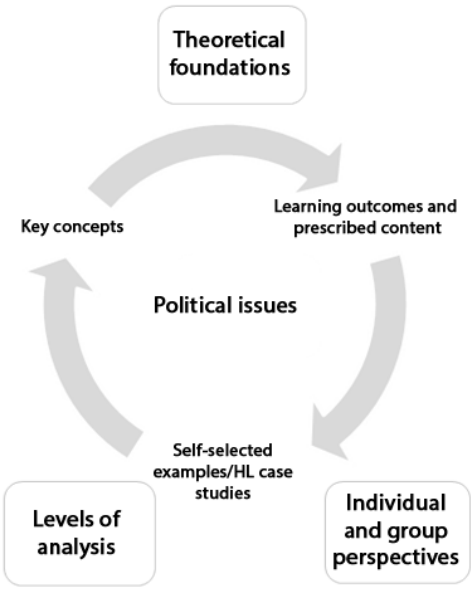
- To what extent can we justify the claim:" Political correctness hinders knowledge formation in human sciences"

GLOBAL POLITICS

Teacher: Susanna Soininen

Global politics is an exciting, dynamic subject that draws on a variety of disciplines in the social sciences and humanities, reflecting the complex nature of many contemporary political issues. The study of global politics enables students to critically engage with different and new perspectives and approaches to politics in order to comprehend the challenges of the changing world and become aware of their role in it as active global citizens. The emphasis is on contemporary political issues and their analysis.

The main structure of all the Global Politics courses is as follows:



Understanding a political issue: In the global politics course, a political issue is any question that deals with how power is distributed and how it operates within social organization, and how people think about, and engage in, their communities and the wider world on matters that affect their lives. Political issues are part of our daily lives.

- Using the key concepts of Global Politics (16) throughout the exploration of the contemporary political issues

- Understanding the Levels of Analysis: Community, Local, National, Regional, International and Global in order to create a full understanding of IB Global Politics

- Understanding the individual and group perspectives. Approaches to gender, ethnicity and religion

- Using the political theories throughout the analysis and understanding the importance of different perspectives for our understanding

Unit	Unit 1: Power, Sovereignty and International Relations
Level	Standard Level

Description

This unit focuses on the dynamics of power and how it is manifested and legitimized at various levels. The roles of state and non-state actors are examined, their interactions in global politics are discussed and their success in achieving their aims and objectives is evaluated.

Key concepts: Power, Sovereignty, Legitimacy, Interdependence, Globalization

Defining of Political issues, how to define power? Who has power in current societies?

Essential understandings

- The nature of a political issue, levels of analysis (Community, Local, National, Regional, International, Global)

- To address essential questions on nature of power, operation of state power in Global politics and Non-state-actors, Communities in Global Politics by using the key concepts and theories on power and role of the states in Global politics.
- To make the difference between variety of actors in Global politics and to understand the basic theories: Realism, Liberalism, Critical approaches in the context of the current world
- Learning outcomes:
    - Nature of power
    - Operation of state power in Global politics
    - Function and impact of international organizations and non-state actors in Global politics
    - Nature and extent of interactions in global politics

Transfer goals

- To understand the role of the Media in impacting our understanding of the Global Issues
- To compare and contrast the use of key concepts of Global Politics in other IB subjects (e.g. development in Economics, History)
- Source evaluation and the use of the IB History OPVL-method
- Creating claims and counterclaims on a political issue and connecting those with real-life examples

Inquiry questions

- To what extent are Non- governmental organizations attacking sovereignty of a state?
- Is it justified to say: There is no upper authority above a state? Use political theory of Realism in your approach.

Student action

- Defining the concept of power: brainstorming in groups
- Inquiry based learning/ the snow ball method used throughout the course: Students create their own research questions (connected to the syllabus and international relations), which they are supposed to investigate in pairs.

- Critical approach on the questions, peer feedback. The big ideas: political issues and the linkage to the syllabus.
- Team learning: dialogue circle and check-inn & check out sessions
- Active participation in discussions: practice of exploring claims and counterclaims
- Debates, group discussion, presentations as common ways of learning throughout the course. Open access to Google Drive and Pedanet materials. You tube lectures and Ted talks on the Main theorists (Meyersheimer, Nye,Waltz)
- IA work Engagement Activity process. Linkage to CAS

Assessment

- Formative and summative assessment: Two Practice essays to be written, peer feedback and teacher feedback. IBO Assessment criteria
- Two Paper one practices, peer feedback and teacher feedback.
- Open discussion on what students have learned and also self-assessment in Manage bac (learning diary)

Learner profile

Inquiry, research, communication, collaboration, critical thinking

TOK links

- How can we justify the claim: "Is it justifiable to find evidence about the truth of a political issue"?
- Which ways of knowing are used in political thinking?

Unit	Unit 2: Human rights
Level	Standard Level

Description

This Unit focuses on the nature and practice of human rights. Debates surrounding human rights are examined. The aim is to develop an understanding of the sensitive nature of the human rights issues.
Key concepts: human rights, justice, liberty, equality

Essential understandings

- Nature and evolution of human rights
- Codification, protection and monitoring of human rights
- Practice of human rights
- Debates surrounding human rights and their application: differing interpretations of justice, liberty and equality

Transfer goals

- To understand the connection between power, economy and human rights
- To compare and contrast the Implementation of human rights issues in other IB subjects; gender, ethnicity and religious perspectives
- To understand the role of the Media in investigating human rights issues (e.g Lisa Kristine´s Ted Talk and pictures on Modern-Day Slavery)
- To connect discussed topics to IB history: De-colonization, the Cold War., Authoritarian states- Democracies

Inquiry questions

- Is it fair to say that poverty and violation of human rights go hand in hand?
- To what extent is it fair to say: Multinational Corporations have a role in preventing violation of human rights?

Student action

- IB DP skills: Collaboration & Social Skills: group work on local NGOs on human rights issues, Research& Thinking Skills: levels of analysis (from community to global level; human rights violations

locally and globally), discussion throughout the unit; in pairs, in groups and as a whole class).
- Practice essay and practice paper one on Human rights unit.
- Inquiry based learning: creating own research questions as a group: investigation of the human rights history and treaties, together with violations of agreements. Power-Unit as a basis for the understanding; the role of the non-state actors versus state-level. Theories´ perspectives. Presentations, debate, snowball-method as ATL Skills

Assessment

- Formative (the use of Wilma tools) and summative assessment (Paper 1 and 2)
- Peer feedback and teacher feedback throughout the unit
- Self-assessment, learning diaries

Learner profile

- Human rights issues are closely connected to Caring, Principled, Open-Minded in order to understand the significance and the implementation of the key concepts of justice, equality and liberty.
- These are promoted throughout the course by contemporary examples and by using various levels of analysis.

TOK links

- Is it possible to make justifiable political decisions on global politics issue by using emotion as a way of knowing?
- How can we acquire objective knowledge about authoritarian states´ violation of human rights?

Unit Unit 3: Development

Level Standard Level

Description

This unit focuses on what development means, how it can be pursued and what may help or stand in the way of people, communities and countries becoming better off in a comprehensive sense. Debates surrounding development are examined.
Key concepts: development, globalization, inequality, sustainability

Essential understandings

- Contested Meanings of Development
- Factors that may promote of inhibit development
- Pathways towards development
- Debates surrounding development: challenges of globalization, inequality and sustainability

Transfer goals

- Linkage between IB ESS, Economics, History and Global Politics when approaching development from various perspectives
- Source Evaluation; role of the Social Media in creating images of development

Inquiry questions; source questions

- Contrast how Source 1 and Source 2 view present-day challenges to the well-being of people, and the strategies they propose for overcoming these and securing sustainable development.
- Using the sources and your own knowledge, evaluate the claim that the most important factor that will affect the success of development will be the involvement of both rich and poor countries.

Student action

- Collaboration & Social skills: Case studies and research on chosen state´s corruption index, democracy index. Presentations on investigated states´ approaches on development. Research & Thinking Skills: levels of analysis (from community to global level; human rights violations locally and globally and their impact on development), discussion throughout the unit; in pairs, in groups and as a whole class).

- Practice essay and practice paper one on Development
- Inquiry based learning: creating own research questions individually and investigating different theories´ perspectives (Capability theory, Modernization theory). Presentations, debate, snowball-method as approaches on teaching and learning

Assessment

- Formative (the use of Wilma tools) and summative assessment (Paper 1 and 2)
- Peer feedback and teacher feedback throughout the unit,
- Self-assessment, learning diaries

Learner profile

Development Unit promotes critical thinking skills: the use of various perspectives how the development can be defined and understood.

TOK links

- Language as a WoK: To what extent can language define our understanding of development?
- Can we justify the claim: The accessibility of knowledge hinders or promotes our understanding of development?

Unit	Unit 4: Peace and conflict
Level	Standard Level

Description

This unit focuses on what peace, conflict and violence mean, how conflicts emerge and develop, and what can be done to build a lasting peace.

Key concepts: peace, conflict, violence, non-violence

Essential understandings

- Contested meanings of peace, conflict and violence
- Causes and parties to conflict
- Evolution of conflict

- Conflict resolution and post-conflict transformation

Transfer goals

- Different levels of analysis; how to define a conflict? Community level conflicts- School environment; how to solve them?
- Conflicts hindering the growth of economy: the future of sustainable development?
- ATL skills: self-management skills in order to hinder conflicts

Inquiry questions

- Evaluate the claim that conflicts today are more often caused by regional rather than international factors.
- "The use of violence can never be legitimate". Discuss the validity of this claim.

Student action

- Brainstorming in groups: the connection between peace & conflict with all previous units: using different levels of analysis and key concepts
- Sophisticated use of ATL skills: case studies on chosen countries and their approaches to peace & conflict (democracy index, peace & conflict index)
- Investigating Johan Galtung´s Just War Theory and making own claims & counterclaims about that. Discussion and debate.
- Group discussions, Team work: dialogue circle and individual case study presentation on the impact of peace& conflict on international relations, human rights and development

Assessment

- Formative (the use of Wilma tools) and summative assessment (Paper 1 and 2)
- Peer feedback and teacher feedback throughout the unit,
- Self-assessment, learning diaries
- Final mock exams at the end of the Unit

Learner profile

Promotion of several Learner Profile skills as a natural part of the unit: Peace and Conflict questions are closely connected e.g. to Caring, Open-Minded, Principled, Knowledgeable.

TOK links

- To what extent do stories in the press reflect our emotional need about the peace and conflict issues, rather than the truth?
- What evidence can we have to reach convincing truth about violation of human rights at war?

HISTORY

Teachers: Jukka Alanko, Susanna Soininen

The basic aim of our history studies is to learn to think historically, which is based on a conscious use of the key concepts of the subject: cause, consequence, change, continuation, significance, perspectives. This thinking includes an understanding of the ethical dimension of historical interpretations. Our history studies should also develop a continuing interest in the past and encourage students to appreciate the complex nature of historical concepts, issues, events and developments. Students should be encouraged to develop their understanding of the methodology and practice of the discipline of history. Teaching historical skills enriches the student's understanding of the subject and encourages the student to apply them to the future study of history or related areas.

Learning goals:

- To develop students´ collaborative, social, research, thinking, knowledge skills.
- Learning methods: The Snowball method, dialogue, debate, essay writing, power point lecture, pair/ group presentations, Socratic seminar (team learning, the use of the dialogue circle)
- Students will understand the importance of key concepts of historical thinking (Change, Continuity, Consequences, Causation, Perspective, Significance)
- Source Evaluation as a part of each unit (OPVL- Origin, Purpose, Value, Limitations)
- The aim of each lesson is to build up self-esteem and to encourage the students to take part in discussions and analytic thinking & to develop their historical skills

TOK links

- Which ways of knowing are the most valuable for acquiring historical knowledge?
- To what extent can we justify historical knowledge?

Unit	Unit 1: Authoritarian states
Level	Higher Level and Standard Level

Description

- The unit explores the 20th century authoritarian states and their leaders from different regions.
- The topic focuses on the rise of such states, the consolidation of power and the aims and results of the authoritarian rule.

Essential understandings

- This topic focuses on exploring the conditions that facilitated the rise of authoritarian states in the 20th century, as well as the methods used by parties and leaders to take and maintain power.
- The topic explores the emergence, consolidation and maintenance of power, including the impact of the leaders' policies, both domestic and foreign, upon the maintenance of power.
- Examination questions for this topic will expect students to make reference to specific authoritarian states in their responses, and some examination questions will require discussion of states from more than one region of the world. In order for students to be able to make meaningful comparisons across all aspects of the prescribed content, it is recommended that a minimum of three authoritarian states should be studied.

Topic: Emergence of authoritarian states
Prescriped content:

- Conditions in which authoritarian states emerged: economic factors; social division; the impact of war; the weakness of the political system

- Methods used to establish authoritarian states: persuasion and coercion; the role of leaders; ideology; the use of force; propaganda

Topic: Consolidation and maintenance of power
Prescribed content:

- The use of legal methods; the use of force; charismatic leadership; the dissemination of propaganda
- The nature, extent and treatment of opposition
- The impact of the success and/or failure of foreign policy on the maintenance of power

Topic: Aims and results of policies
Prescribed content:

- The aims and impact of domestic economic, political, cultural and social policies
- The impact of policies on women and minorities
- Authoritarian control and the extent to which it was achieved

Transfer goals

- To develop students´ collaborative, social, research, thinking, knowledge skills
- Students will grasp the key concepts of historical thinking (the four C's + significance and perspectives)
- The aim of each lesson is to build up self-esteem and to encourage the students to take part in discussions and analytic thinking

Inquiry questions

- Compare and contrast two authoritarian leaders from two different regions in their approach to economic policies.
- To what extent is it fair to say that the rise to power of two authoritarian leaders had so much in common?

Student action

- Students will use several learner profile skills throughout the unit: inquiry, research, collaborative, social, thinking, knowledge skills

- Learning methods: Snowball method, dialogue, debate, essay writing, power point lecture, pair/ group presentations, Socratic seminar (team learning, the use of the dialogue circle
- Students will grasp the key concepts of historical thinking (the four C's + significance and perspectives)

Assessment

- Formative Assessment: Paper 1 practice, Essay writing (Process writing), Continuous peer and teacher feedback
- Summative Assessment Paper 1, Paper 2
- Self-Assessment: The use of key concepts and historical understanding (Think-Aloud method)

TOK links

- Which ways of knowing are the most valuable for acquiring historical knowledge?
- To what extent can we justify historical knowledge?

Unit	Unit 2: Prescribed subject: Move to Global War
Level	Higher Level and Standard Level

Description

- The unit explores the pathway for WW2 by focusing on the causes, events and responses of the expansionist policies of Japan, Italy and Germany.
- The evaluative use of both primary and secondary sources will be implemented inclusively throughout the course.

Essential understandings

Case study 1: Japanese expansion in East Asia (1931–1941)

- Causes of expansion
  - The impact of Japanese nationalism and militarism on foreign policy

        - Japanese domestic issues: political and economic issues, and their impact on foreign relations
        - Political instability in China
    - Events
        - The Japanese invasion of Manchuria and northern China (1931)
        - The Sino-Japanese War (1937–1941)
        - The Three Power/Tripartite Pact; the outbreak of war; Pearl Harbor (1941)
    - Responses
        - The League of Nations and the Lytton report
        - Political developments within China—the Second United Front
        - International response, including US initiatives and increasing tensions between the US and Japan

Case study 2: German and Italian expansion (1933–1940)

- Causes of expansion
    - The impact of fascism and Nazism on the foreign policies of Italy and Germany
    - The impact of domestic economic issues on the foreign policies of Italy and Germany
    - Changing diplomatic alignments in Europe; the end of collective security; appeasement
- Events
    - German challenges to the post-war settlements (1933–1938)
    - Italian expansion: Abyssinia (1935–1936); Albania; entry into the Second World War
    - German expansion (1938–1939); Pact of Steel, Nazi–Soviet Pact and the outbreak of war
- Responses
    - International response to German aggression (1933–1938)
    - International response to Italian aggression (1935–1936)

- International response to German and Italian aggression (1940)

Transfer goals

- Evaluative use of primary and secondary sources
- Source evaluation as a significant part of the transfer goals: Understanding the importance of exploring the nature of historical knowledge and origins of the sources.
- To make students understand the importance of critical thinking and the nature of academic knowledge.
- Use of the key concepts of History: Change, Continuity, Consequences, Causation, Significance and Perspectives. History is not only about remembering the evidence, it has a deeper approach to knowledge
- Encouragement of the practice of thinking, collaborative and social skills throughout

Inquiry questions

- To what extent is it fair to say that the aggressive foreign policy of authoritarian leaders led to the outbreak of WW2?
- With reference to its origin, purpose and content, analyze the values and limitations of Source A for historians studying the Italian invasion of Abyssinia.

Student action

- Students will use several learner profile skills throughout the unit: inquiry, research, collaborative, social, thinking, knowledge skills
- Learning methods: Snowball method, dialogue, debate, essay writing, power point lecture, pair/ group presentations, Socratic seminar (team learning, the use of the dialogue circle
- Students will grasp the key concepts of historical thinking (the four C's + significance and perspectives)

Assessment

- Formative Assessment: Paper 1 practice, continuous peer and teacher feedback

- Summative Assessment: Paper 1
- Self-Assessment: The use of key concepts and historical understanding (Think-Aloud method)

TOK links

- To what extent can we gain knowledge about the primary and secondary sources as bases of historical knowledge?
- Under what circumstances can we use emotion as a way of knowing in justifying evidence about the causes of WWII?

Unit	Unit 3–6: History of Europe
Level	Higher Level

Description

- The units explore perspectives of the European history from the 1850´s until 2000 (At least a hundred-year period will be studied).
- These units are optional according to the teacher's choices.

Transfer goals

- To make students to understand the importance of critical thinking and the nature of academic knowledge.
- Use of the key concepts of History: Change, Continuity, Consequences, Causation, Significance and Perspectives. History is not only about remembering the evidence, it has a deeper approach to knowledge.
- The evaluative use of primary and secondary sources
- Source evaluation as a significant part of the transfer goals: Understanding the importance of exploring the nature of historical knowledge and origins of the sources.
- Understanding the IB essay structure; argument, evidence and analysis, conclusion
- Encouragement of the practice of thinking, collaborative and social skills throughout

Student action

- Students will use several learner profile skills throughout the unit: inquiry, research, collaborative, social, thinking, knowledge skills.
- Learning methods: Snowball method, dialogue, debate, essay writing, power point lecture, pair/ group presentations, Socratic seminar (team learning, the use of the dialogue circle)
- Paper 1-practices with different kind of types of historical documents
- The preparation process of the Historical Investigations (the IAs) will be a part

Assessment

- Formative Assessment: Paper 1 practice, Essay writing (Process writing), Continuous peer and teacher feedback
- Summative Assessment Paper 1, Paper 2, Paper 3
- Self-Assessment: The use of key concepts and historical understanding: (Think-Aloud method and the use of the WILMA formative self-assessment tool.

Unit	Unit 3: Imperial Russia, revolution and the establishment of the Soviet Union (1855–1924)
Level	Higher Level

Description

- The unit explores the development of the late 19th century Imperial Russia to the Soviet Union in 1924.
- "From Change to Continuity."

Essential understandings

- This section deals with modernization and conservatism in tsarist Russia and the eventual collapse of the tsarist autocracy, as well as the revolutions of 1917, the Civil War and the rule of Lenin. There is a focus on the concepts of change and continuity, with

examination and consideration of the social, economic and political factors that brought about change.

- Alexander II (1855–1881): the extent of reform
- Policies of Alexander III (1881–1894) and Nicholas II (1894–1917): economic modernization, tsarist repression and the growth of opposition
- Causes of the 1905 Revolution (including social and economic conditions and the significance of the Russo-Japanese War); consequences of the 1905 Revolution (including Stolypin and the Dumas)
- The impact of the First World War and the final crisis of autocracy in February/March 1917
- 1917 Revolutions: the February/March Revolution; provisional government and dual power (Soviets); the October/November Revolution; the Bolshevik Revolution; Lenin and Trotsky
- Lenin's Russia/Soviet Union; consolidation of the new Soviet state; Civil War; War Communism; New Economic Policy (NEP); terror and coercion; foreign relations

Inquiry questions

- How fair is it to say that "WW1 was the main reason for the February Revolution"?
- To what extent is it fair to say that "the October revolution of 1917 was a revolution from below"?

Unit	Unit 4: The Soviet Union and post-Soviet Russia (1924–2000)
Level	Higher Level

Description

- The unit explores the development from the consolidation of the Soviet state until late 20th century post-Soviet Russia as a successor to the collapsed USSR.

- "Change or continuity?"

Essential understandings

- This section examines the consolidation of the Soviet state from 1924 and the methods applied to ensure its survival, growth and expansion inside and outside the borders of the Soviet Union. It explores the rise and nature of the rule of Stalin, Khrushchev, Brezhnev and their policies. East-West relations post-1945 in relation to Soviet aims and leadership should also be considered. Finally, the decline and collapse of the Soviet Union should be considered, as well as political and economic developments in post-Soviet Russia.
- Soviet Union (1924–1941): Stalin and the struggle for power (1924–1929); the defeat of Trotsky; Stalin's policies of collectivization and the Five-Year Plans; government and propaganda under Stalin; the purges and the Great Terror
- The impact of the Great Patriotic War (1941–1945); the post-war Soviet Union (1945–1953): political and economic developments
- Khrushchev and Brezhnev: domestic policies and foreign relations
- Transformation of the Soviet Union (1985–1991): Gorbachev (aims, policies and the extent of their success); political developments and change
- The collapse of the Soviet Union; post-Soviet Russia to 2000; the role and policies of Yeltsin; political and economic developments to 2000

Inquiry questions

- To what extent were Stalin's economic policies successful in modernising the Soviet Union?
- Compare and contrast Khrushchev's and Brezhnev's foreign policies.

Unit	Unit 5: European states in the inter-war years (1918–1939)
Level	Higher Level

Description

- The unit is focused on post-WW1 domestic policies in Germany, Italy and Spain along with Finland as an optional case study.
- The course explores different choices the states made between the authoritarian and democratic political systems.

Essential understandings

- This section deals with domestic developments in certain key European states in the period between the two world wars. It requires the study of four European countries: Germany, Italy, Spain and any one other country. The section considers the impact of the end of the First World War, then examines the economic, social and cultural changes in each country during the 1920s and 1930s.
- Weimar Germany: constitutional, political, economic/financial and social issues (1918–1933); initial challenges (1918–1923); the "Golden Era" under Stresemann (1924–1929); the crisis years and the rise of Hitler (1929–1933)
- Hitler's Germany (1933–1939): consolidation of power; Hitler's pre-war domestic policies, including economic, social and political policies; the nature of the Nazi state; the extent of resistance to the Nazis
- Italy (1918–1939): the rise of Mussolini; consolidation of power; Mussolini's pre-war domestic policies, including economic, social and political policies; the nature of the fascist state
- Spain (1918–1939): political, social and economic conditions in Spain; the Primo de Rivera regime; polarization and political parties under the Second Republic; Azaña and Gil Robles; the causes of the Civil War; foreign involvement; reasons for the nationalist victory under Franco
- A case study of domestic political, economic and social developments in one European country (other than Germany, Italy or Spain) in the inter-war years.

Inquiry questions

- Is it fair to say that the Weimar Democracy was doomed to fail?
- To what extent is it fair to say: "Economy is a driving force of history"?

Unit	Unit 6: Versailles to Berlin: European Diplomacy 1919-1945
Level	Higher Level

Description

- The unit focuses on international relations of Europe from the post-WW1 peace agreements until the end of WW2.
- The course advances the knowledge and understanding of Europe's move to global war and attempts to keep a peace.

Essential understandings

- This section addresses international relations in Europe from 1919 to 1945 with initial emphasis on the Paris Peace Settlement: its goals, impact and the problems relating to its enforcement. The section covers attempts to promote collective security and international cooperation through the League of Nations and multilateral agreements (outside the League mechanism), arms reduction and the pursuit of foreign policy goals without resort to violence. This section also addresses the individual foreign policies of Italy, Germany, France, Britain and Russia/the Soviet Union, looking at the aims, issues and success of each one. It concludes with a study of the Second World War, looking particularly at the impact of the war and the reasons for German defeat and Allied victory.
- Peace settlements (1919–1923): Versailles; Neuilly; Trianon; St Germain; and Sèvres/Lausanne—aims, issues and responses

- The League of Nations and Europe: successes and failures; the search for collective security; developments in the successor states of central and eastern Europe
- Italian and German foreign policies (1919–1941): aims, issues and the extent of their success
- Collective security and appeasement (1919–1941): aims, issues and the extent of their success; the role of British, French and Russian/Soviet foreign policies (1919–1941); Chamberlain and the Munich Crisis
- Causes of the Second World War and the development of European conflict (1939–1941); the wartime alliance (1941–1945); reasons for Axis defeat in 1945 and for Allied victory; the role of economic, strategic and other factors
- The impact of the Second World War on civilian populations in any two countries between 1939–1945

Inquiry questions

- Analyze the significance of Paris Peace Treaties as a cause for WW2.
- To what extent is it fair to say that the League of Nations succeeded in its aims throughout in the 1920-30s?

Unit	Unit 7: The Cold War. *World history topic 12:* The Cold War: Superpower tensions and rivalries (20th century)
Level	Higher Level and Standard Level

Description

- The Cold War dominated global affairs from the end of the Second World War to the early 1990s.
- The Unit focuses on how superpower rivalries did not remain static but changed according to styles of leadership, strength of ideological beliefs, economic factors and crises involving client states.

- The aim is to promote an international perspective on the Cold War by requiring the study of Cold War leaders, countries and crises from more than one region of the world.

Essential understandings

- Rivalry, Mistrust and Accord: The Breakdown of the Grand Alliance (1943-1949), the role of ideology, fear and aggression: economic interests, a comparison of the roles of the US and the USSR. The US, USSR and China—superpower relations (1947–1979): containment; peaceful co-existence; Sino-Soviet and Sino-US relations; detente
- Confrontation and reconciliation; reasons for the end of the Cold War (1980–1991): ideological challenges and dissent; economic problems; the arms race
- Crises; Leaders and Nations
- The impact of two leaders, each chosen from a different region, on the course and development of the Cold War (Stalin, Mao, Castro)
- The impact of Cold War tensions on two countries (excluding the USSR and the US), examples of Germany and Cuba).
- Cold War crises case studies: detailed study of any two Cold War crises from different regions: examination and comparison of the causes, impact and significance of the two crises (the Berlin Blockade, Second Berlin Crisis, the Cuban Missile Crisis).

Transfer goals

- Coherent use of critical thinking and credible understanding the key concepts of History: Change, Continuity, Consequences, Causation, Significance and Perspectives.
- Linkage between Global Politics, Economics and History: comparative use of specific key terms of each subject. Furthermore, understanding the viewpoints of each subject on the same topic.
- Appreciation of the coherent use of the IB essay structure; argument, evidence and analysis, conclusion.

- Sophisticated understanding of the continuity of historical events.

Inquiry questions

- To what extent is it fair to say that the beginning of the Cold War was inevitable?
- Analyze and discuss the significance of different Cold War periods for international relations by using primary sources.

Student action

- Sophisticated use of collaborative, social, research, thinking, knowledge skills.
- Learning methods: Snowball method, dialogue, debate, essay writing, power point lecture, pair/group presentations, Socratic seminar (team learning, the use of the dialogue circle
- The topic will be discussed throughout with the use of key concepts of history: each group will have their own key concept as a lens for the Cold War events.
- The aim of each lesson is to build up self-esteem and to encourage the students to take part in discussions and analytic thinking).

Assessment

As in previous units

TOK links

- How can we justify the knowledge about different interpretations of the beginning of the Cold War?
- Is it possible to find unbiased knowledge about the views of politicians?
- Which ways of knowing are the most valuable in order to justify knowledge about the beginning of the Cold War?

Unit	Unit 8: Authoritarian states; *World history topic 10:* Authoritarian states (20th century)
Level	Higher Level and Standard Level

Description

- This topic focuses on exploring the conditions that facilitated the rise of authoritarian states in the 20th century, as well as the methods used by parties and leaders to take and maintain power.
- The topic explores the emergence, consolidation and maintenance of power, including the impact of the leaders' policies, both domestic and foreign, upon the maintenance of power.
- Examination questions for this topic will expect students to make reference to specific authoritarian states in their responses, and some examination questions will require discussion of states from more than one region of the world. In order for students to be able to make meaningful comparisons across all aspects of the prescribed content, it is recommended that a minimum of three authoritarian states should be studied.

Essential understandings

- Emergence of authoritarian states
    - Conditions in which authoritarian states emerged: economic factors; social division; the impact of war; the weakness of the political system
    - Methods used to establish authoritarian states: persuasion and coercion; the role of leaders; ideology; the use of force; propaganda
- Consolidation and maintenance of power
    - The use of legal methods; the use of force; charismatic leadership; dissemination of propaganda
    - The nature, extent and treatment of opposition
    - The impact of the success and/or failure of foreign policy on the maintenance of power
- Aims and results of policies
    - The aims and impact of domestic economic, political, cultural and social policies

- The impact of policies on women and minorities
- Authoritarian control and the extent to which it was achieved

Authoritarian leader examples: Mao and Castro

Inquiry questions:

- Compare and contrast two authoritarian leaders from different regions in their approach to economic policies.
- To what extent is it fair to say that the rise to power of two authoritarian leaders had so much in common?

Transfer Goals

- Continuity in History, Economics and Global Politics. Comparison between the past and the present
- Economy as a driving force of history
- Sophisticated evaluation of primary and secondary sources. "Doing history"- approach.
- The changed role of the media in creating conditions for an authoritarian leader´s rise

Student Action

- Students will use several learner profile skills throughout the unit: inquiry, research, collaborative, social, thinking, knowledge skills
- Learning methods as in previous units: Snowball method, dialogue, debate, essay writing, power point lecture, pair/ group presentations, Socratic seminar (team learning, the use of the dialogue circle

Assessment

As in previous Units

TOK links

- How can we acquire knowledge about the intentions of authoritarian leaders' objectives?
- Is it justified to use emotion as a WOK to make judgements about authoritarian leaders´ actions?

PSYCHOLOGY

Teacher Markus Lajunen

The aims of the psychology course are to:

- Develop an understanding of the biological, cognitive and sociocultural factors affecting mental processes and behaviour
- Apply an understanding of the biological, cognitive and sociocultural factors affecting mental processes and behaviour to at least one applied area of study
- Understand diverse methods of inquiry
- Understand the importance of ethical practice in psychological research in general and observe ethical practice in their own inquiries
- Ensure that ethical practices are upheld in all psychological inquiry and discussion
- Develop an awareness of how psychological research can be applied to address real-world problems and promote positive change.

Unit	Unit 1:
Level	Higher Level and Standard Level

Description

Approaches to researching behaviour, Biological approach to understanding behaviour and Cognitive approach to understanding behaviour

Essential Understandings

- Criteria for psychological research
- Sampling techniques
- Experimental designs
- Reliability and validity in psychological research

- Correlational studies
- Qualitative and quantitative research
- Credibility or trustworthiness in psychological research
- Bias in psychological research
- Ethics in psychological research
- The Brain and behaviour
- Hormones and pheromones and behaviour
- Genetics and behaviour
- Cognitive processing
- Reliability of cognitive processes
- Emotion and cognition

Transfer goals

- Ability to understand Psychology as a science
- Ability to understand the biological and cognitive foundations of human behaviour
- Development of thinking and researcher skills through various individual and group activities. (Communication, thinking, research and social skills.)

Inquiry questions

- What is psychological research?
- How do brains, hormones and genetics influence human behaviour?
- How do genetics influence human behaviour?
- What are schemas and how do they operate?
- What is memory and how reliable is it?
- What are thinking and decision-making and how reliable are they?
- How do emotions influence our cognitive functions?

Student Action

- Lecture
- Small group/pair work
- PowerPoint lecture/notes
- Group presentations

- Student lecture/leading

Assessment

- Summative: Paper 1 mock exam(s) (80%) and class activities (20%)
- Formative: continuous self-assessment and teacher feedback

Learner profile

- Inquirers: Studying psychological research methods and applying them to biological and cognitive approach on human behaviour in IB Psychology Unit 1 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 1 aims to develop an understanding towards psychological research methods and biological and cognitive foundations of human behaviour.
- Thinkers: IB Psychology Unit 1 fosters critical and creative thinking skills in analysing psychological research methods and biological and cognitive foundations of behaviour.

TOK links

- To what extent can human behaviour be explained with natural sciences?
- Under what circumstances is it justifiable to explain human behaviour with knowledge gained from the natural sciences?
- To what extent is our knowledge shaped by our biological and evolutionary preconditions?
- What is the role of prior experience in gaining new knowledge?
- What role do personal memories play in the formation of reliable knowledge?
- How certain is memory as a source of knowledge?
- What evidence do we have of the reliability of memory as a source of knowledge?
- To what extent can we describe, explain, predict and control human decisions?
- What evidence do we have on the reliability of intuition as a source of knowledge?

- To what extent can intuition be considered as a reliable source of knowledge?
- How trustworthy is intuitive knowledge?
- In what sense can emotions be used to justify knowledge?

Unit	Unit 2 Animal research in psychology and the effects of digital technology on human condition
Level	Higher Level

Description

The role of animal research in understanding human behaviour and Cognitive processing in the digital world (HL extensions)

Essential understandings

- The value of animal models in psychological research.
- Whether animal research can provide insight into human behaviour.
- Ethical considerations in animal research.
- The influence of digital technology on cognitive processes.
- The positive and negative effects of modern technology on cognitive processes.
- Methods used to study the interaction between digital technology and cognitive processes.

Transfer goals

- Ability to understand the nature of animal research with all its controversies
- Ability to critically evaluate the research on effects of digital technology on human cognition and behaviour
- Development of thinking, self-management and research skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- What is the value of animal research in psychological research?
- What kinds of research methodologies are used in animal research and in the research concerning the effects of digital technology on human cognition?
- How does digital technology influence human cognition?

Student Action

- Lecture
- Small group/pair work
- PowerPoint lecture/notes
- Group presentations
- Student lecture/leading

Assessment

Summative and formative: class activities, continuous self-assessment and teacher feedback

Learner profile

- Inquirers: Studying psychological research methods and applying them to animal research and the effects of digital technology on human cognition in IB Psychology Unit 2 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 2 aims to develop an understanding towards animal research in psychology and the effects of digital technology on human cognition.
- Thinkers: IB Psychology Unit 2 fosters critical and creative thinking skills in analysing animal research in psychology and research methods in studying the effects of digital technology to human cognition.
- Communicators: Through learning outputs and research assignments in IB Psychology Unit 2 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Open-minded: Studying animal research and the effects of digital technology on human cognition in IB Psychology Unit 2

can used to seek and evaluate a range of points of view and grow from those experiences.

- Caring: Studying animal research in IB Psychology Unit 2 can lead to increased empathy, compassion and respect. Moreover, it may lead to action and service that might have a positive difference in the lives of others and in the world around us.
- Balanced: Studying the effects of digital technology on human cognition and welfare enables the students to understand the importance of different aspects of their lives in order to pursue well-being for them and others. Acquired self-management skills in IB Psychology Unit 2 helps students to acknowledge their interdependence with other people and with the world in which they live.
- Reflective: Studying animal research and the effects of digital technology on human cognition in IB Psychology Unit 2 can be used to consider the world and their own ideas and experience. Moreover, it can help to understand students' strengths and weaknesses in order to support our learning and personal development.

TOK links

- How can evidence be used to justify ethical standpoints?
- To what extent are ethical values based on emotion?
- To what extent are models useful as a tool of acquiring knowledge?
- To what extent can digital technology shape the ways of knowing?

Unit	Unit 3 Sociocultural psychology
Level	Higher Level and Standard Level

Description

Sociocultural approach to understanding behaviour

Essential understanding

- The individual and the group
- Cultural origins of behaviour and cognition
- Cultural influences our individual attitudes, identity and behaviour

Transfer goals

- Ability to understand how individuals and groups interact
- Ability to understand cultural origins of behaviour and cognition
- Ability to understand how culture influences our individual attitudes, identity and behaviour
- Development of thinking, self-management and researcher skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- How do individuals and groups interact?
- What are the cultural origins of behaviour and cognition?
- How does culture influence individual attitudes, identity and behaviour?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Group presentations
- Student lecture/leading

Assessment (summative and formative)

- Summative: Paper 1 mock exam(s) (80%) and class activities (20%)
- Formative: continuous self-assessment and teacher feedback

Learner profile

- Inquirers: Studying sociocultural approach to understanding human behaviour in IB Psychology Unit 3 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 3 aims to develop an understanding towards sociocultural foundations of human behaviour.
- Thinkers: IB Psychology Unit 3 fosters critical and creative thinking skills in analysing sociocultural research.
- Communicators: Through different sociocultural learning assignments in IB Psychology Unit 3 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Principled: Studying and acknowledging different cultural perspectives can help students to act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. Furthermore, it helps students to take responsibility for their actions and their consequences.
- Open-minded: Studying sociocultural approach on human behaviour in IB Psychology Unit 3 can used to seek and evaluate a range of points of view and grow from those experiences.
- Caring: Studying various cultural perspectives in IB Psychology Unit 3 can lead to increased empathy, compassion and respect. Moreover, it may lead to action and service that might have a positive difference in the lives of others and in the world around us.
- Reflective: Studying various cultural perspectives in IB Psychology 4 can be used to consider the world and students own ideas and experience. Moreover, it can help students to understand strengths and weaknesses in order to support their learning and personal development.

TOK links

- What evidence, if anything, is there to support the claim 'human language abilities are innate'?
- Under what circumstances can imagination be considered a valid way of knowing?
- How certain is imagination as a way of knowing?
- Under what circumstances can culture influence personal knowledge?
- Do cultures have an effect on how accurately we can acquire knowledge of the world?
- To what extent are our ethical beliefs influenced by our cultural background?

Unit	Unit 4 IA task
Level	Higher Level and Standard Level

Description

IBDP Psychology IA task

Essential Understandings

- Planning and conducting a simple psychological experiment
- Writing scientific text in form of research report

Transfer goals

- Ability to plan and to conduct a simple psychological experiment and write scientific text in form of research report
- Development of thinking, self-management and researcher skills through the IA task process. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

How to plan and implement IA task in IB Psychology?

Student Action

- Lecture
- Small group/pair work
- PowerPoint lecture/notes

Assessment (summative and formative)

- Summative: predicted grade of the IA task
- Formative: continues self-assessment and teacher feedback

Learner Profile

- Inquirers: Planning and conducting a replication of a genuine psychological experiment in IB Psychology Unit 4 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 4 aims to develop an understanding psychological research and scientific writing.
- Thinkers: IB Psychology Unit 4 fosters critical and creative thinking skills through the IA task process.
- Communicators: Through IA task process in IB Psychology Unit 4 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Risk-takers: Through IA task process in IB Psychology Unit 4 students will engage in an activity outside their comfort zone. Students can approach uncertainty with forethought and determination and work independently and cooperatively to explore new ideas and innovative strategies. Students have a chance to be resourceful and resilient in the face of challenges and change.

TOK links

- To what extent can the human sciences use mathematical techniques to make accurate predictions?
- To what extent can human behaviour be accurately explained with the use of statistical techniques?

- Under what circumstances are the use of mathematical models a valid way of generating knowledge?

Unit	Unit 5 Abnormal psychology (Option, unless decided otherwise by the teacher and the students)
Level	Higher Level and Standard Level

Description

Abnormal psychology (Option)

Essential Understandings

- Factors influencing diagnosis.
- Etiology of abnormal psychology.
- Treatment of mental disorders.

Transfer goals

- The ability to understand factors influencing diagnosis.
- The ability to understand the etiology of abnormal behaviour.
- The ability to understand the treatment of mental disorders.
- Development of thinking, self-management and researcher skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- What are the factors influencing diagnosis?
- What is the etiology for abnormal psychology?
- How can mental disorders be treated?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes

- Individual presentations
- Group presentations
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: Paper 2 mock exam(s)
- Formative: continuous self-assessment and teacher feedback

Learner Profile

- Inquirers: Studying abnormal psychology IB Psychology Unit 5 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 5 aims to develop an understanding of mental disorders and their treatment.
- Thinkers: IB Psychology Unit 5 fosters critical and creative thinking skills in analysing research related to abnormal psychology.
- Communicators: Through different learning assignments in IB Psychology Unit 5 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Principled: Studying and acknowledging different mental disorders can help students to act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. Furthermore, it helps students to take responsibility for their actions and their consequences.
- Open-minded: Studying abnormal psychology in IB Psychology Unit 5 can be used to seek and evaluate a range of points of view and grow from those experiences.
- Caring: Studying abnormal psychology in IB Psychology Unit 5 can lead to increased empathy, compassion and respect. Moreover, it may lead to action and service that might have a positive difference in the lives of others and in the world around us.

- Reflective: Studying abnormal psychology in IB Psychology 4 can be used to consider the world and students own ideas and experience. Moreover, it can help students to understand strengths and weaknesses in order to support their learning and personal development.

TOK links

- What role do emotions play in the formation of knowledge?
- To what extent are social norms a reliable source of knowledge about acceptable behaviour?
- What kind of evidence is used to justify social norms?
- Is the formation of knowledge always a conscious process?
- What kind of evidence is there to justify distinctions between normality and abnormality?
- To what extent is our knowledge based on labelling?
- What kind of evidence, if anything, is there to support the claim 'our minds are culturally constructed'?

Unit	Unit 6 Psychology of human relationships (Option, unless decided otherwise by the teacher and the students)
Level	Higher Level

Description

Psychology of human relationships (HL only option)

Essential Understandings

- Personal relationships
- Group dynamics
- Social responsibility

Transfer goals

- Ability to understand personal relationships, group dynamics and social responsibility
- Development of thinking, self-management and research skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- What are personal relationships and how are they formed?
- What is the role of communication in personal relationships?
- How may relationships change and end?
- How does competition and co-operation happen in group dynamics?
- How does prejudice and discrimination take place in group dynamics?
- What are the origins of conflict and resolution in group dynamics?
- What is meant by by-standerism?
- What is prosocial behaviour and how it can be promoted?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Individual presentations
- Group presentations
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: Paper 2 mock exam(s)
- Formative: continues self-assessment and teacher feedback

Learner profile

- Inquirers: Studying the psychology of human relationships IB Psychology Unit 6 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 6 aims to develop an understanding of personal relationships, group dynamics and social responsibility.
- Thinkers: IB Psychology Unit 6 fosters critical and creative thinking skills in analysing research related to the psychology of human relationships.
- Communicators: Through different learning assignments in IB Psychology Unit 6 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Principled: Studying and acknowledging different aspects of personal relationships, group dynamics and social responsibility can help students to act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. Furthermore, it helps students to take responsibility for their actions and their consequences.
- Open-minded: Studying the psychology of human relationships IB in IB Psychology Unit 6 can be used to seek and evaluate a range of points of view and grow from those experiences.
- Caring: Studying abnormal psychology in IB Psychology Unit 5 can lead to increased empathy, compassion and respect. Moreover, it may lead to action and service that might have a positive difference in the lives of others and in the world around us.
- Reflective: Studying abnormal psychology in IB Psychology 4 can be used to consider the world and students own ideas and experience. Moreover, it can help students to understand strengths and weaknesses in order to support their learning and personal development.

TOK links

- How do social relationships shape our ways of knowing?

- To what extent does online interaction effect the ways we know about human behaviour?
- How can social pressure bias knowledge formation in scientific research?

Unit	Unit 7 The influence of globalization and research methods for paper 3
Level	Higher Level

Description

The influence of globalization on individual behaviour, approaches to researching behaviour for Paper 3 and reviewing the whole syllabus and preparing for the Finals (Core HL extensions + whole IB Psychology syllabus)

Essential Understandings

- How globalization may influence behaviour
- The effect of the interaction of local and global influences on behaviour
- Methods used to study the influence of globalization on behaviour
- Research methods in quantitative and qualitative research for Paper 3
- Reviewing for the finals

Transfer goals

- The ability to evaluate the influence of globalization on individual behaviour.
- The ability to evaluate psychological research related to the influence of globalization on individual behaviour
- The ability to evaluate quantitative and qualitative research.
- The ability to conduct simple quantitative and qualitative research.

- Ability to review effectively for the finals in terms of the required content and skills.
- Development of thinking, self-management and research skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- How does globalization influence individual behaviour?
- How to conduct correlative research?
- How to conduct observations?
- How to conduct interviews?
- What are case studies?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Individual presentations
- Group presentations
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: Paper 3 mock exam(s)
- Formative: continues self-assessment and teacher feedback

Learner Profile

- Inquirers: Studying the influence of globalization on individual behaviour, approaches to researching behaviour and reviewing the whole IB Psychology syllabus in IB Psychology Unit 7 fosters curiosity and develops skills for inquiry and research.
- Knowledgeable: IB Psychology Unit 7 aims to develop an understanding of the influence of globalization on individual behaviour, approaches to researching behaviour for Paper 3 and reviewing the whole IB Psychology syllabus.

- Thinkers: IB Psychology Unit 7 fosters critical and creative thinking skills in analysing research related to the influence of globalization on individual behaviour. Moreover, critical thinking skills are developed further with tasks related to quantitative and qualitative research.
- Communicators: Through different learning assignments in IB Psychology Unit 7 students will be able to express themselves confidently and creatively. In addition, students will learn to collaborate effectively, listening carefully to the perspectives of other individuals and groups.
- Principled: Studying the influence of globalization on individual behaviour in IB Psychology Unit 7 can help students to act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. Furthermore, it helps students to take responsibility for their actions and their consequences.
- Open-minded: Studying the influence of globalization on individual behaviour in IB Psychology Unit 7 can be used to seek and evaluate a range of points of view and grow from those experiences.
- Risk-takers: Through various research exercises in IB Psychology Unit 7 students will engage in an activity outside their comfort zone. Students can approach uncertainty with forethought and determination and work independently and cooperatively to explore new ideas and innovative strategies. Students have a chance to be resourceful and resilient in the face of challenges and change.
- Caring: Studying the influence of globalization on individual behaviour in IB Psychology Unit 7 can lead to increased empathy, compassion and respect. Moreover, it may lead to action and service that might have a positive difference in the lives of others and in the world around us.
- Reflective: Studying the influence of globalization on individual behaviour in IB Psychology Unit 7 can be used to consider the world and students' own ideas and experience. Moreover, it can

help students to understand their strengths and weaknesses in order to support their learning and personal development.

TOK links

- How can we justify the claim 'Globalization leads to a clash of incommensurable cultural knowledge systems'?
- To what extent is our personal knowledge a collection of internally conflicting knowledge systems?
- To what extent should scientific theories be evaluated by their predictive validity?

Unit	Unit 8 Review
Level	Higher Level and Standard Level

Description

Reviewing the whole syllabus and preparing for the Finals (Whole IBDP Psychology syllabus)

Essential Understandings

Whole IBDP Psychology syllabus (see previous units)

Transfer goals

- Ability to review effectively for the finals in terms of the required content and skills
- Development of thinking, self-management and researcher skills through various individual and group activities. (Communication, self-management, thinking, research and social skills.)

Inquiry questions

- What skills should be practised for the finals?
- What content should be reviewed for the finals?

Student Action

- Lecture
- Socratic seminar
- Small group/pair work
- PowerPoint lecture/notes
- Individual presentations
- Group presentations
- Student lecture/leading
- Interdisciplinary Learning

Assessment (summative and formative)

- Summative: Paper 1, Paper 2 and Paper 3 mock exams
- Formative: continuous self-assessment and teacher feedback

Learner Profile

Since all aspects of the Learner Profile are promoted in the previous units, this review unit promotes all aspects of the Learner Profile through different review tasks.

TOK links

- To what extend does studying academic skills influence our personal knowledge?
- How does education shape the ways of knowing?
- What evidence, if anything, is there to support the claim 'the study of human sciences shapes our behaviour'?

SUBJECT GROUP: SCIENCES

Biology, Chemistry, Environmental systems and societies, Physics

Aims

- To appreciate scientific study and creativity within a global context through stimulating and challenging opportunities
- To acquire a body of knowledge, methods and techniques that characterize science and technology
- To apply and use a body of knowledge, methods and techniques that characterize science and technology
- To develop an ability to analyse, evaluate and synthesize scientific information
- To develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- To develop experimental and investigative scientific skills including the use of current technologies
- To develop and apply 21st century communication skills in the study of science
- To become critically aware, as global citizens, of the ethical implications of using science and technology
- To develop an appreciation of the possibilities and limitations of science and technology
- To develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge.

International-mindedness in the subject group

"Science itself is an international endeavour—the exchange of information and ideas across national boundaries has been essential to the progress of science. This exchange is not a new phenomenon but it has accelerated in recent times with the development of information and communication technologies. Indeed, the idea that science is a

Western invention is a myth—many of the foundations of modern-day science were laid many centuries ago by Arabic, Indian and Chinese civilizations, among others. Teachers are encouraged to emphasize this contribution in their teaching of various topics, perhaps through the use of timeline websites. The scientific method in its widest sense, with its emphasis on peer review, open-mindedness and freedom of thought, transcends politics, religion, gender and nationality. Where appropriate within certain topics, the syllabus details sections in the group 4 guides contain links illustrating the international aspects of science."
(Source: Science guides of IB Organization)

Approaches to teaching within the subject group

Students will be actively involved with the learning process taking responsibility of their own studies. In many cases, they are given on opportunity to choose from different approaches to a topic. For example, the teacher may ask whether they prefer working in groups, pairs or individually, when the aim is to understand the double slit interference. During every lesson, peer discussion will be used as part of teaching. When the teacher asks a question, he gives 1 to 5 minutes to discuss the question in pairs. Then, students are given an opportunity to share their views with the teacher and each other.

Based on inquiry

- Promotion of thinking skills
- Critical use of sources and encouraging students to search themselves
- encouraging students to formulate their own research questions
- Students are encouraged to formulate their own research questions, design their own experimental method and carry out the experiments.

Focused on conceptual understanding

New knowledge is based on the old knowledge. Students build new details into their previous knowledge. Concepts can be divided in macro-concepts and micro-concepts. Macro-concepts are

overarching concepts, not specific for the subject, e.g. structure and function.

Developed in local and global contexts

Samples are collected locally. E.g. water samples are taken from the local waters and local plants are investigated. A field course/trip is arranged in biology in the nearby area. Group 4 project topics have local and global dimensions.

Focused on effective teamwork and collaboration

- Active use of teamwork and group projects in interaction
- Teacher collaboration within the subject group
- Group 4 project
- Learning to respect others and their ideas

Differentiated to meet the needs of all learners

Teaching takes into account different learning styles. All students will be given the same set of core questions. There will be conceptual, short response and extended response questions at different levels. The most talented students will be given challenging problems and extra work according to their needs.

The information will be provided in written form (slides, teacher notes, books, articles, etc.), and explained orally by the teachers and students. Multimedia (simulations, videos, flipped classroom lessons, etc.) will be used.

Informed by assessment (formative and summative)

- Peer-assessment of assignments
- Use of self-assessment and reflection
- Continuous feedback
- The assessment criteria are explained
- Efficient use of digital platforms in assessment
- Transparency of assessment via the school's data protected information channel to the

TOK links

- How is scientific knowledge similar to and different from knowledge in other areas of knowledge?
- What is the role of imagination and intuition in science?
- The precautionary principle is meant to guide decision-making conditions where a lack of certainty exists. Is certainty ever possible in natural sciences?

CAS links

- Describe the role of creativity in scientific knowledge.
- How does science manifest itself in sports?

Promoting research skills in the subject group

In open-ended practicals and practical investigations students will learn the process of science. Encouraging students to be inquires.

BIOLOGY

Teachers: Hanna Joutsela

Unit	Unit 1: Cell biology (Topic 1)
Level	Higher Level and Standard Level

Essential Understandings

- Students will be able to state cell theory.
- Students will be able to state atypical examples of cells.
- Students will be able to list the functions of life in unicellular organisms.
- Students will be able to explain why the surface area to volume ratio is important in the limitation of cell size.
- Students will be able to define emergent properties.
- Students will be able to explain the process of cell differentiation.
- Students will be able to define stem cells.
- Students will be able to describe the therapeutic uses of stem cells.
- Students will be able to compare light microscopes and electron microscopes.
- Students will be able to distinguish between prokaryotic and eukaryotic cells.
- Students will be able to define binary fission.
- Students will be able to describe the structure of cell membranes.
- Students will be able to list the functions of membrane proteins.
- Students will be able to explain the different methods of membrane transport (endocytosis, exocytosis, simple diffusion, facilitated diffusion, osmosis and active transport by pump proteins).
- Students will be able to distinguish between hypotonic, hypertonic isotonic solutions.
- Students will be able to explain Pasteur's experiments.
- Students will be able to explain the endosymbiotic theory.
- Students will be able to define mitosis.

- Students will be able to describe the cell cycle and its phases (prophase, metaphase, anaphase, telophase, cytokinesis, interphase).
- Students will be able to distinguish mitosis in plant and animal cells.
- Students will be able to describe the control of the cell cycle by cyclins.
- Students will be able to describe the tumour formation and cancer.

Transfer goals of the unit

- Students will be able to use a light microscope.
- Students will be able to draw cell structures as seen with the light microscope.
- Students will be able to calculate the magnification of drawings and the actual size of structures shown in drawings or micrographs.
- Students will be able to draw the ultrastructure of prokaryotic cells based on electron micrographs.
- Students will be able to draw the ultrastructure of eukaryotic cells based on electron micrographs.
- Students will be able to estimate the osmolarity in tissues.
- Students will be able to calculate a mitotic index from a micrograph.

Inquiry questions

- How can we decide when one model (e.g. a model of cell membrane) is better than another?
- How are we able to know the difference between the living and the non-living environment?

Student Action in the unit

- Small group/pair work
- PowerPoint lecture/notes
- Individual presentations
- Group presentations

- Practicals

Assessment

- Formative assessment: Class room participation, writing a lab report, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data based, short and extended response questions

Learner Profile

Students are encouraged to be thinkers: active, ask questions and think of themselves. Communication is needed in group works and in writing a lab report. Thinking skills are used in analysis of data-based questions and own data.

Students accumulate a large amount of knowledge through their studies of each biology unit. Equally important as knowledge is understanding, application and skills.

TOK links

Under what circumstances can we justify that one model represents reality better than other?

Unit	Unit 2: Ecology (Topic 4)
Level	Higher Level and Standard Level

Essential Understandings

- Students will be able to define species.

- Students will be able to identify the modes of nutrition (autotrophs, heterotrophs, consumers, detritivores and saprotrophs).
- Students will be able to define population, community and ecosystem.
- Students will be able to outline the nutrient cycles.
- Students will be able to explain the sustainability of ecosystems.
- Students will be able to identify trophic levels (producer, primary
- consumer, secondary consumer, tertiary consumer) in food chain.
- Students will be able to outline the energy flow in ecosystem (sources and losses).
- Students will be able to state greenhouse gases.
- Students will be able to explain the greenhouse effect and the enhanced greenhouse effect (global warming).
- Students will be able to explain the ocean acidification and its effects on corals.

Transfer goals

- Ecosystems require a continuous supply of energy to fuel life processes and to replace energy lost as heat.
- Continued availability of carbon in ecosystems depends on carbon cycling.
- Concentrations of gases in the atmosphere affect climates experienced at the Earth's surface.
- Students will be able to use the chi-squared test with data obtained by quadrat sampling to test for association between two species.
- Students will be able to set up a sealed mesocosm.
- Students will be able to construct a pyramid of energy.
- Students will be able to construct a diagram of the carbon cycle (combined for terrestrial and aquatic ecosystem)

Inquiry questions

- What are the potential impacts of funding bias?

- The precautionary principle is meant to guide decision-making in conditions where a lack of certainty exists. Is certainty ever possible in natural sciences?

Student Action in the unit

- Small group/pair work
- PowerPoint lecture/notes
- Group presentations
- Practicals

Assessment

- Formative assessment: Class room participation, writing a lab report, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data-based, short and extended response questions

Learner Profile

Students are encouraged to be active, ask questions and think of themselves. Communication is practiced in group works and thinking skills in analysis of data-based questions and own data. Behaving in a way which shows caring and concern for the environment is an integral part of this unit. For example, samples are returned to pond after examining pond life.

TOK links

- To what extent is is possible to acquire knowledge about the certainty in natural sciences

---

Unit	Unit 3: Genetics, evolution and biodiversity (Topics 3, 5 and 10 (HL only))

Level Higher Level and Standard Level

Essential Understandings

- Students will be able to define gene, allele and genome.
- Students will be able to outline the causes of sickle cell anemia.
- Students will be able to outline the Human Genome Project.
- Students will be able to distinguish between prokaryotic chromosomes and eukaryotic chromosomes.
- Students will be able to distinguish between haploid and diploid nuclei.
- Students will be able to state that the number of chromosomes is a characteristic feature of a members of a species.
- Students will be able to describe sex determination in humans.
- Students will be able to define karyogram.
- Students will be able to outline meiosis.
- Students will be able to explain bivalents formation and grossing over.
- Students will be able to explain how genetic variation is promoted in meiosis.
- Students will be able to explain how non-disjunction can cause Down syndrome.
- Students will be able to define dominant, recessive and co-dominant alleles.
- Students will be able to outline inheritance of ABO blood groups.
- Students will be able to state the pattern of inheritance of cystic fibrosis, Huntington's disease, re-green colour-blindness and hemophilia.
- Students will be able to list causes of mutations.
- Students will be able to describe biotechnological methods (gel electrophoresis, PCR, DNA profiling, genetic modification and cloning).
- Students will be able to explain exchange of genetic material between non-sister homologous chromatids and formation of chiasmata.

- Students will be able to distinguish between nonlinked and linked genes.
- Students will be able to distinguish between discrete and continuous variation.
- Students will be able to define gene pool, allele frequency and evolution.
- Students will be able to distinguish between patterns of natural selection (stabilizing, directional and disruptive).
- Students will be able to distinguish between sympatric speciation and allopatric speciation.
- Students will be able to distinguish between temporal, behavioural and geographical isolation.
- Students will be able to distinguish between gradualism in speciation and punctuated equilibrium.
- Students will be able to define polyploidy.

Transfer goals

- Chromosomes carry genes in a linear sequence that is shared by members of a species.
- Alleles segregate during meiosis allowing new combinations to be formed by the fusion of gametes.
- The inheritance of genes follows patterns.
- Students will be able to use a database to determine differences in the base sequence of a gene in different species.
- Students will be able to use a database to identify the locus of a human gene and its protein product.
- Students will be able to use karyotypes to deduce sex and diagnose Down syndrome.
- Students will be able to draw diagrams to show the stages of meiosis.
- Students will be able to construct Punnett grids for predicting the outcomes of monohybrid genetic grosses.
- Students will be able to analyze pedigree charts to deduce the pattern of inheritance of genetic diseases.
- Students will be able to assess risks and benefits of GM crops.

- Students will be able to design an experiment to assess one factor affecting the rooting of stem-cuttings.
- Students will be able to draw diagrams to show chiasmata formed by crossing over.
- Students will be able to construct and analyze Punnett grids for dihybrid traits.
- Students will be able to use chi-squared tests to determine whether the difference between an observed and expected frequency distribution is statistically significant.

Inquiry questions

- Did Mendel alter his results for publication?
- There is a link between sickle cell anemia and prevalence of malaria. How can we know whether there is a causal link in such cases or simply a correlation?

Student Action

- Small group/pair work
- PowerPoint lecture/notes
- Group presentations
- Practicals

Assessment

- Formative assessment: Class room participation, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data based, short and extended response questions

Learner Profile

Communication is practiced in group works. Thinking skills are needed in analysis of data-based questions. Open-mindedness can be nurtured in this unit through examples. Many scientific advances have

happened fastest when groups of scientists with different expertise and from different background work together, e.g. human genome project.

TOK links

- Under what circumstances can we know if there is a causal link or simply correlation?

Unit	Unit 4: Human physiology and animal physiology (Topics 6 and 11 (HL only)
Level	Higher Level and Standard Level

Essential Understandings

- Students will know the following content:
- Students will be able to define peristalsis.
- Students will be able to describe the contents of pancreatic juice.
- Students will be able to describe digestion and absorption in small intestine.
- Students will be able to distinguish arteries, veins and capillaries.
- Students will be able to distinguish systolic and diastolic pressure.
- Students will be able to define the double circulation of blood.
- Students will be able to outline causes and consequences of occlusion of the coronary arteries and coronary thrombosis.
- Students will be able to describe how the heartbeat is initiated.
- Students will be able to describe how heart rate is controlled.
- Students will be able to describe the cardiac cycle.
- Students will be able to list barriers to infection.
- Students will be able to distinguish non-specific immunity and specific immunity.
- Students will be able to describe effects of HIV on the immune system and methods of transmission.

- Students will be able to outline the use of antibiotics.
- Students will be able to distinguish cell respiration, gas exchange and ventilation.
- Students will be able to describe the structure of an alveolus.
- Students will be able to describe the ventilation system.
- Students will be able to outline the use of different muscles (antagonistic muscles) in inspiration and expiration.
- Students will be able to outline the causes and consequences of lung cancer and emphysema.
- Students will be able to outline the structure and function of neurons.
- Students will be able to distinguish resting potentials and action potentials.
- Students will be able to define a synapse.
- Students will be able to describe synaptic transmission.
- Students will be able to describe the secretion and function of insulin, glucagon, thyroxin, leptin and melatonin.
- Students will be able to outline the sex determination in humans.
- Students will be able to outline the menstrual cycle.
- Students will be able to describe in vitro fertilization.
- Students will be able to define antigen.
- Students will be able to describe antigens in blood transfusions.
- Students will be able to outline specific immune response (activation of helper t-cells and B-cells, production of plasma cells and memory cells).
- Students will be able to list roles of antibodies.
- Students will be able to explain the idea of vaccination.
- Students will be able to define zoonosis.
- Students will be able to describe the production and effects of histamines.
- Students will be able to outline the production of monoclonal antibodies.
- Students will be able to define antagonistic muscles.
- Students will be able to give examples of synovial joints and what kind of movements they allow.

- Students will be able to describe the structure of skeletal muscles and each myofibril.
- Students will be able to outline mechanism and control of skeletal muscle contraction.
- Students will be able to describe the structure and function of human kidney.
- Students will be able to describe spermatogenesis and oogenesis and list their differences.
- Students will be able to describe fertilization and mechanisms that prevent polyspermy.
- Students will be able to outline the structure and function of placenta.
- Students will be able to outline the hormone production during the pregnancy and birth.

Transfer goals

- Students will be able to identify arteries, veins and capillaries.
- Students will be able to recognize the chambers and valves of the heart and the blood vessels connected to heart.
- Students will be able to annotate diagrams of the male and female reproductive system to show names of the structures and their functions.
- Students will be able to annotate a diagram of the human elbow.
- Students will be able to draw a labelled diagram of the structure of a sarcomere.
- Students will be able to analyse electron micrographs to find the state of contraction of muscle fibres.

Inquiry questions

- What is normal in a case of digestion of lactose?
- Our current understanding is that emotions are the product of activity in the brain rather than the heart. Is knowledge based on science more valid than knowledge based on intuition?

Student Action

- Small group/pair work
- PowerPoint lecture/notes
- Group presentations
- Practicals

Assessment

- Formative assessment: Class room participation, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data based, short and extended response questions

Learner profile

A teacher can help students to be inquires by encouraging our natural curiosity of ourselves. It's easy to "hook" students into this unit. Communication is practiced in presentations, debates, written tasks and when collaborating with other students during practical lab work. Thinking skills are needed in analysis of data-based questions and own data.

TOK links

- To what extent can we justify what is normal or abnormal in natural sciences; Is knowledge based on reasoning more valid than knowledge based on intuition?

Unit	Unit 5: Molecular biology (Topics 2, 7 (HL only) and 8 (HL only)
Level	Higher Level and Standard Level

Essential understandings

- Students will be able to state that urea is an example of compound that is produced by living organisms but can also be artificially synthesized.
- Students will be able to list all the groups of carbon compounds (carbohydrates, lipids, proteins and nucleic acids).
- Students will be able to distinguish the two parts of metabolism: anabolism and catabolism.
- Students will be able to explain hydrogen bonding in water.
- Students will be able to list, explain and give examples of properties of water.
- Students will be able to distinguish between hydrophilic and hydrophobic substances.
- Students will be able to distinguish between monosaccharides, disaccharides and polysaccharides.
- Students will be able to describe condensation reaction and hydrolysis reaction.
- Students will be able to describe the structure of triglycerides.
- Students will be able to describe how carbohydrates and lipids are used as energy storage.
- Students will be able to distinguish between saturated, unsaturated, monounsaturated and polyunsaturated fatty acids.
- Students will be able to evaluate the health risks of fats.
- Students will be able to describe the structure of polypeptides and their diversity.
- Students will be able to state that there are 20 different amino acids that have differences between their R groups.
- Students will be able to distinguish between globular and fibrous three-dimensional structure of a protein.
- Students will be able to explain the denaturation of proteins.
- Students will be able to list the different functions of proteins and state the functions of rubisco, insulin, immunoglobulin, rhodopsin, collagen and spider silk.
- Students will be able to define proteome.
- Students will be able to outline the enzyme activity.
- Students will be able to outline the use of immobilized enzymes.
- Students will be able to describe the structure of DNA and RNA.

- Students will be able to describe the semi-conservative replication of DNA and state the enzymes needed.
- Students will be able to outline the polymerase chain reaction.
- Students will be able to outline transcription and translation.
- Students will be able to distinguish codons and anticodons.
- Students will be able to distinguish between anaerobic and aerobic cell respiration.
- Students will be able to outline the use of ATP as a source of energy.
- Students will be able to outline the use of anaerobic cell respiration in yeasts in industry.
- Students will be able to outline the anaerobic respiration in humans.
- Students will be able to define photosynthesis.
- Students will be able to describe the role of nucleosomes in DNA packing.
- Students will be able to state the direction of replication.
- Students will be able to list the functions of non-coding regions of DNA.
- Students will be able to describe the regulation of gene expression by proteins, nucleosomes and environment.
- Students will be able to state the direction of transcription.
- Students will be able to describe post-transcriptional modifications and MRNA splicing.
- Students will be able to describe the structure of the eukaryotic ribosomes and tRNA.
- Students will be able to describe translation (initiation, elongation and termination).
- Students will be able to distinguish free ribosomes and bound ribosomes.
- Students will be able to describe protein structure (primary, secondary, tertiary and quarternary).
- Students will be able to describe the role of enzymes.
- Students will be able to distinguish competitive and non-competitive inhibitors.
- Students will be able to describe end-product inhibition.

- Students will be able to describe stages of cell respiration: glycolysis, the link reaction, the Krebs cycle, the electron transport chain and chemiosmosis.
- Students will be able to describe the structure and function in mitochondrion.
- Students will be able to state the location of light-dependent reactions and light-independent reactions of photosynthesis.
- Students will be able to describe light-dependent and light-independent reactions of photosynthesis.
- Students will be able to describe how the structure of the chloroplast is adapted to its function in photosynthesis.

Students will be able to draw molecular diagrams of glucose, ribose, a saturated fatty acid and a generalized amino acid.
Students will be able to identify carbohydrates, lipids and proteins from molecular diagrams.
Students will be able to use molecular visualization software to image carbohydrate molecules.
Students will be able to determine the body mass index by calculaton or use of a nomogram.
Students will be able to draw molecular diagrams to show the formation of a peptide bond between amino acids.
Students will be able to carry out an enzyme experiment.
Students will be able to draw the simple diagrams of the structure of DNA and RNA.
Students will be able to analyse the results of Meselson and Stahl's DNA replication experiments.
Students will be able to separate photosynthetic pigments by chromatography.
Students will be able to draw an absorption spectrum for chlorophyll and an action spectrum for photosynthesis.
Students will be able to design an experiment to investigate limiting factors of photosynthesis.
Students will be able to analyse the results of The Hershey-Chase experiment providing evidence that DNA is the genetic material.
Students will be able to identify polysomes in an electron micrograph.

Students will be able to distinguish competitive and non-competitive inhibitors. from graphs at specified substrate concentrations.
Students will be able to calculate rates of reaction.
Students will be able to annotate a diagram of a mitochondrion.

Transfer goals of the unit

- Students will be able to draw molecular diagrams of glucose, ribose, a saturated fatty acid and a generalized amino acid.
- Students will be able to identify carbohydrates, lipids and proteins from molecular diagrams.
- Students will be able to use molecular visualization software to image carbohydrate molecules.
- Students will be able to determine the body mass index by calculaton or use of a nomogram.
- Students will be able to draw molecular diagrams to show the formation of a peptide bond between amino acids.
- Students will be able to carry out an enzyme experiment.
- Students will be able to draw the simple diagrams of the structure of DNA and RNA.
- Students will be able to analyse the results of Meselson and Stahl's DNA replication experiments.
- Students will be able to separate photosynthetic pigments by chromatography.
- Students will be able to draw an absorption spectrum for chlorophyll and an action spectrum for photosynthesis.
- Students will be able to design an experiment to investigate limiting factors of photosynthesis.
- Students will be able to analyse the results of The Hershey-Chase experiment providing evidence that DNA is the genetic material.
- Students will be able to identify polysomes in an electron micrograph.
- Students will be able to distinguish competitive and non-competitive inhibitors. from graphs at specified substrate concentrations.
- Students will be able to calculate rates of reaction.
- Students will be able to annotate a diagram of a mitochondrion.

- Life is based on carbon compounds including carbohydrates, lipids, proteins and nucleic acids.
- The structure of DNA is ideally suited to its function (replication and protein synthesis).
- Cell respiration and photosynthesis are complex metabolic pathways that consist of chains and cycles of enzyme-catalysed reactions.

Student Action in the unit

- Small group/pair work
- PowerPoint lecture/notes
- Practicals

Assessment

- Formative assessment: Class room participation, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data based, short and extended response questions

Learner Profile

Thinking skills are needed in analysis of data-based questions and in analysis of data from practicals. Students are expected to understand some complex biological processes, e.g. DNA replication and photosynthesis. This involves thinking and reasoning in the form of structure and function of individual cell components. A teacher can help students to be balanced and cope in times of stress when there is a lot to study and learn.

TOK links

There are conflicting views as to the harms and benefits of fats in diets. How do we decide between competing views?

Many metabolic pathways have been described following a series of carefully controlled and repeated experiments. To what degree can looking at component parts give us knowledge of the whole?

Unit	Unit 6: Plant biology
Level	Higher Level

Essential Understandings

- Students will know the following content:
- Students will be able to explain the movement of water from roots to leaves.
- Students will be able to describe the xylem structure.
- Students will be able to list adaptations for water conservation.
- Students will be able to explain the transport of organic compounds from sources to sinks.
- Students will be able to describe the structure of phloem sieve tubes.
- Students will be able to describe how plants grow.
- Students will be able to explain how plant hormones control growth in the shoot apex.
- Students will be able to describe micropropagation of plants and how it is used.
- Students will be able to explain how flowering is controlled in plants.
- Students will be able to define pollination, fertilization and seed dispersal and describe how success in plant reproduction depends on them.

Transfer goals

- Structure and function are correlated in the xylem and phloem of plants.

- Plants adapt their growth to environmental conditions.
- Reproduction in flowering plants is influenced by the biotic and abiotic environment.
- Students will be able to measure transpiration rates using potometers.
- Students will be able to draw xylem vessels in stems based on microscope images.
- Students will be able to identify xylem and phloem in light micrographs.
- Students will be able to analyse data from experiments measuring phloem transport rates using aphid stylets and radioactively labelled carbon dioxide.
- Students will be able to draw an animal-pollinated flower.
- Students will be able to draw internal structure od seeds.
- Students will be able to design experiments to test factors affecting germination.

Student Action

- Small group/pair work
- PowerPoint lecture/notes
- Practicals

Assessment

- Formative assessment: Class room participation, peer assessment, self-assessment, oral feedback
- Summative assessment:
    - Exams:
        - Paper 1, Multiple choice questions
        - Paper 2, Data based, short and extended response questions

Learner profile

Thinking skills are needed in analysis of data-based questions and the data of practicals. Students are encouraged to be risk-takers in designing their own experiments, e.g. germination experiments.

Students are also risk-takers in many other situations during the lessons, e.g. when giving a presentation or asking questions in front of others.

TOK links

- Plants communicate chemically both internally and externally. To what extent can plants be said to have language?

Unit	Unit 7: Option
Level	Higher Level and Standard Level

The option is decided each year by the group from the following:

- Neurobiology and behavior
- Biotechnology and bioinformatics
- Ecology and conservation
- Human physiology

Detailed curriculum is delivered in the beginning of the unit.

CHEMISTRY

Teachers: Marita Mansikkamäki, Sakari Salo

Unit	Unit 1: Topics 2, 12,1,11,3,13 from the IBDP Chemistry syllabus
Level	Higher Level and Standard Level

Essential understandings

Topic 2:

- Atoms contain a positively charged dense nucleus composed of protons and neutrons (nucleons).
- Negatively charged electrons occupy the space outside the nucleus.
- The mass spectrometer is used to determine the relative atomic mass of an element from its isotopic composition
- Use of the nuclear symbol notation to deduce the number of protons,
- neutrons and electrons in atoms and ions.
- Calculations involving non-integer relative atomic masses and abundance of isotopes from given data, including mass spectra.
- Emission spectra are produced when photons are emitted from atoms as excited electrons return to a lower energy level.
- The line emission spectrum of hydrogen provides evidence for the existence of electrons in discrete energy levels, which converge at higher energies.
- The main energy level or shell is given an integer number, n, and can hold a maximum number of electrons, 2n2. A more detailed model of the atom describes the division of the main energy level into s, p, d and f sub-levels of successively higher energies.
- Sub-levels contain a fixed number of orbitals, regions of space where there is a high probability of finding an electron.
- Each orbital has a defined energy state for a given electronic configuration and chemical environment and can hold two electrons of opposite spin.
- Description of the relationship between colour, wavelength, frequency and energy across the electromagnetic spectrum.
- Distinction between a continuous spectrum and a line spectrum.
- Description of the emission spectrum of the hydrogen atom, including the relationships between the lines and energy transitions to the first, second and third energy levels.
- Recognition of the shape of an s atomic orbital and the px,py and pz atomic orbitals.

- Application of the Aufbau principle, Hund's rule and the Pauli exclusion principle to write electron configurations for atoms and ions up to Z =36.

Topic 12 (HL only)

- In an emission spectrum, the limit of convergence at higher frequency corresponds to the first ionization energy.
- Trends in first ionization energy across periods account for the existence of main energy levels and sub-levels in atoms.
- Successive ionization energy data for an element give information that shows relations to electron configurations.
- Applications and skills: Solving problems using E=hv
- Calculation of the value of the first ionization energy from spectral data which gives the wavelength or frequency of the convergence limit.
- Deduction of the group of an element from its successive ionization energy data.
- Explanation of the trends and discontinuities in first ionization energy across a period.

Topic 1

- The mole is a fixed number of particles and refers to the amount, n, of substance.
- Masses of atoms are compared on a scale relative to 12 C and are expressed as relative atomic mass (Ar) and relative formula/molecular mass (Mr).
- Molar mass (M) has the units g mol-1
- Calculation of the molar masses of atoms, ions, molecules and formula units.
- Solution of problems involving the relationships between the number of particles, the amount of substance in moles and the mass in grams.
- Interconversion of the percentage composition by mass
- The SI system (Système International d'Unités) refers to the metric system of measurement, based on seven base units.

Topic 11

- Qualitative data includes all non-numerical information obtained from observations not from measurement.
- Quantitative data are obtained from measurements, and are always associated with random errors/uncertainties, determined by the apparatus, and by human limitations such as reaction times
- Discussion of ways to reduce uncertainties in an experiment
- Estimation of whether a particular source of error is likely to have a major or minor effect on the final result.
- Distinction between accuracy and precision in evaluating results.

Topic 3

- The periodic table is arranged into four blocks associated with the four sub-levels—s, p, d, and f.
- The periodic table consists of groups (vertical columns) and periods (horizontal rows).
- The period number (n) is the outer energy level that is occupied by electrons.
- The number of the principal energy level and the number of the valence electrons in an atom can be deduced from its position on the periodic table.
- The periodic table shows the positions of metals, non-metals and metalloids.
- Deduction of the electron configuration of an atom from the element's position on the periodic table, and vice versa.
- Vertical and horizontal trends in the periodic table exist for atomic radius, ionic radius, ionization energy, electron affinity and electronegativity.
- Trends in metallic and non-metallic behaviour are due to the trends above.
- Oxides change from basic through amphoteric to acidic across a period.
- Applications and skills: Prediction and explanation of the metallic and non-metallic behaviour of an element based on its position in the periodic table.

- Discussion of the similarities and differences in the properties of elements in the same group, with reference to alkali metals (group 1) and halogens (group 17).
- Construction of equations to explain the pH changes for reactions of Na2O, MgO, P4O10, and the oxides of nitrogen and sulphur with water

Topic 13 (HL only)

- Transition elements have variable oxidation states, form complex ions with ligands, have coloured compounds, and display catalytic and magnetic properties.
- Zn is not considered to be a transition element as it does not form ions with incomplete d-orbitals.
- Transition elements show an oxidation state of +2 when the s-electrons are removed.
- Explanation of the ability of transition metals to form variable oxidation states from successive ionization energies.
- Explanation of the nature of the coordinate bond within a complex ion.
- Deduction of the total charge given the formula of the ion and ligands present.
- Explanation of the magnetic properties in transition metals in terms of unpaired electrons.
- The d sub-level splits into two sets of orbitals of different energy in a complex ion.
- Complexes of d-block elements are coloured, as light is absorbed when an electron is excited between the d-orbitals.
- The colour absorbed is complementary to the colour observed.
- Explanation of the effect of the identity of the metal ion, the oxidation number of the metal and the identity of the ligand on the colour of transition metal ion complexes.
- Explanation of the effect of different ligands on the splitting of the d-orbitals in transition metal complexes and colour observed using the spectrochemical series.

Transfer goals

- The usage certain isotope as a part of nuclear energy and weapon programmes. Understanding the radioactivity of certain isotopes
- Gives good basics to understand
- nuclear reactions in physics studies and usage of radioisotopes in nuclear medicine for diagnostics, treatment and research, as tracers in biochemical and pharmaceutical research, and as "chemical clocks" in geological and archaeological dating (Options C.3 and C.7—nuclear fission and Option D.8—nuclear medicine)
- analytical techniques (Topics 11.3, 21.1 and options D.8 and D.9—NMR)
- Absorption and emission spectra are widely used in astronomy to analyse light from stars. Atomic absorption spectroscopy is a very sensitive means of determining the presence and concentration of metallic elements
- Topics 3.1 and 3.2—periodicity
- Topic 4.1—deduction of formulae of ionic compounds
- Topic 6.1—Maxwell–Boltzmann distribution as a probability density function
- Physics topic 7.1 and option D.2—stellar characteristics
- Electron microscopy has led to many advances in biology, such as the ultrastructure of cells and viruses. The scanning tunnelling microscope (STM) uses a stylus of a single atom to scan a surface and provide a 3-D image at the atomic level.
- Topic 3.2—periodic trends
- Topic 4.1—ionic bonding
- Topic 15.1—lattice enthalpy
- Topic 2.1—the scale of atoms and their component particle
- Topic 8.5—production of acid rain. What is the global impact of acid deposition?
- The toxic transition metal ions in environmental systems.

Inquiry questions

What are the observations of nuclear isotopes as the atomic number increases? (The isotope chart)

Student Action

- Class discussions
- Class assignments
- Laboratory work (e.g. Flame tests, Measurement lab: Moles, grams, Avogadro's number, accuracy and error of measurement, Investigation of complex ions using a spectrometer data logger (HL), Investigating transition metals using redox titrations, and function as catalysts)
- Usage of databases (HL: trends of IE)
- Usage of simulations (eg. phED Build an Atom to strengthen students' understanding of the basic concepts of atoms and ions)
- Presentation of radioactive isotopes, awareness of the dangers and benefits (Radionuclides carry dangers to health due to their ionizing effects on cells, optional)

Assessment (summative and formative)

- Oral feedback is given throughout the unit
- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile

Principled, Caring: environmental issues, mining, medicinal treatments are discussed in the context of the unit. Inquirers: open-ended questions are presented to stimulate curiosity

TOK links

- How does the knowledge we gain about the natural world depend on the questions we ask and the experiments we perform?
- Which ways of knowing do we use to interpret indirect evidence gained through the use of technology?
- "One aim of the physical sciences has been to give an exact picture of the material world. One achievement…has been to

prove that this aim is unattainable." —Jacob Bronowski. What are the implications of this claim for the aspirations of natural sciences in particular and for knowledge in general?

- The Periodic Table is an excellent example of classification in science. How does classification and categorization help and hinder the pursuit of knowledge?

Unit	Unit 2: Topics 4, 14, 1, 11 from the IBDP Chemistry syllabus
Level	Higher Level and Standard Level

Essential Understandings

Topic 4

- Positive ions (cations) form by metals losing valence electrons.
- Negative ions (anions) form by non-metals gaining electrons.
- The number of electrons lost or gained is determined by the electron configuration of the atom.
- The ionic bond is due to electrostatic attraction between oppositely charged ions.
- Under normal conditions, ionic compounds are usually solids with lattice structures.
- Deduction of the formula and name of an ionic compound from its component ions, including polyatomic ions.
- Explanation of the physical properties of ionic compounds (volatility, electrical conductivity and solubility) in terms of their structure.
- A covalent bond is formed by the electrostatic attraction between a shared pair of electrons and the positively charged nuclei.
- Single, double and triple covalent bonds involve one, two and three shared pairs of electrons respectively. Bond length decreases, and bond strength increases as the number of shared electrons increases.

- Bond polarity results from the difference in electronegativities of the bonded atoms.
- Deduction of the polar nature of a covalent bond from electronegativity values
- Lewis (electron dot) structures show all the valence electrons in a covalently bonded species.
- The "octet rule" refers to the tendency of atoms to gain a valence shell with a total of 8 electrons.
- Some atoms, like Be and B, might form stable compounds with incomplete octets of electrons.
- Resonance structures occur when there is more than one possible position for a double bond in a molecule.
- Shapes of species are determined by the repulsion of electron pairs according to VSEPR theory.
- Carbon and silicon form giant covalent/network covalent structures.
- Deduction of Lewis (electron dot) structure of molecules and ions showing all valence electrons for up to four electron pairs on each atom.
- The use of VSEPR theory to predict the electron domain geometry and the molecular geometry for species with two, three and four electron domains.
- Prediction of bond angles from molecular geometry and presence of non-bonding pairs of electrons.
- Prediction of molecular polarity from bond polarity and molecular geometry.
- Deduction of resonance structures, examples include but are not limited to C6 H6, CO_3^{2-} and O3.
- Explanation of the properties of giant covalent compounds in terms of their structures.
- Intermolecular forces include London (dispersion) forces, dipole-dipole forces and hydrogen bonding.
- The relative strengths of these interactions are London (dispersion)forces < dipole-dipole forces < hydrogen bonds.
- Deduction of the types of intermolecular force present in substances, based on their structure and chemical formula.

- Explanation of the physical properties of covalent compounds (volatility, electrical conductivity and solubility) in terms of their structure and intermolecular forces.
- A metallic bond is the electrostatic attraction between a lattice of positive ions and delocalized electrons.
- The strength of a metallic bond depends on the charge of the ions and the radius of the metal ion.
- Alloys usually contain more than one metal and have enhanced properties.
- Explanation of electrical conductivity and malleability in metals.
- Explanation of trends in melting points of metals.
- Explanation of the properties of alloys in terms of non-directional bonding.

Topic 14 (HL only)

- Covalent bonds result from the overlap of atomic orbitals. A sigma bond (σ) is formed by the direct head-on/end-to-end overlap of atomic orbitals, resulting in electron density concentrated between the nuclei of the bonding atoms. A pi bond(π) is formed by the sideways overlap of atomic orbitals, resulting in electron density above and below the plane of the nuclei of the bonding atoms.
- Formal charge (FC) can be used to decide which Lewis (electron dot) structure is preferred from several. The FC is the charge an atom would have if all atoms in the molecule had the same electronegativity. FC = (Number of valence electrons)-½(Number of bonding electrons)-(Number of non-bonding electrons). The Lewis (electron dot) structure with the atoms having FC values closest to zero is preferred.
- Exceptions to the octet rule include some species having incomplete octets and expanded octets.
- Delocalization involves electrons that are shared by/between all atoms in a molecule or ion as opposed to being localized between a pair of atoms.
- Resonance involves using two or more Lewis (electron dot) structures to represent a particular molecule or ion. A resonance

structure is one of two or more alternative Lewis (electron dot) structures for a molecule or ion that cannot be described fully with one Lewis (electron dot) structure alone.

- Prediction whether sigma (σ) or pi (π) bonds are formed from the linear combination of atomic orbitals.
- Deduction of the Lewis (electron dot) structures of molecules and ions showing all valence electrons for up to six electron pairs on each atom.
- Application of FC to ascertain which Lewis (electron dot) structure is preferred from different Lewis (electron dot) structures.
- Deduction using VSEPR theory of the electron domain geometry and molecular geometry with five and six electron domains and associated bond angles
- Explanation of the wavelength of light required to dissociate oxygen and ozone.
- Description of the mechanism of the catalysis of ozone depletion when catalysed by CFCs and NOx.
- A hybrid orbital results from the mixing of different types of atomic orbitals on the same atom.
- Explanation of the formation of sp3, sp2and sp hybrid orbitals in methane, ethene and ethyne.
- Identification and explanation of the relationships between Lewis (electron dot) structures, electron domains, molecular geometries and types of hybridization.

Topic 1

- Atoms of different elements combine in fixed ratios to form compounds which have different properties from their component elements.
- Mixtures contain more than one element and/or compound that are not chemically bonded together and so retain their individual properties.
- Mixtures are either homogeneous or heterogeneous.
- Deduction of chemical equations when reactants and products are specified.

- Application of the state symbols (s), (l), (g) and (aq) in equations.
- Explanation of observable changes in physical properties and temperature during changes of state.
- The empirical formula and molecular formula of a compound give the simplest ratio and the actual number of atoms present in a molecule respectively
- Solution of problems involving the relationships between the number of particles, the amount of substance in moles and the mass in grams.
- Interconversion of the percentage composition by mass and the empirical formula.
- Determination of the molecular formula of a compound from its empirical formula and molar mass.
- Obtaining and using experimental data for deriving empirical formulas from reactions involving mass changes.
- Reactants can be either limiting or excess.
- The experimental yield can be different from the theoretical yield.
- Avogadro's law enables the mole ratio of reacting gases to be determined from volumes of the gases. The molar volume of an ideal gas is a constant at specified temperature and pressure.
- The molar concentration of a solution is determined by the amount of solute and the volume of solution.
- A standard solution is one of known concentration.
- Solution of problems relating to reacting quantities, limiting and excess reactants, theoretical, experimental and percentage yields.
- Calculation of reacting volumes of gases using Avogadro's law.
- Solution of problems and analysis of graphs involving the relationship between temperature, pressure and volume for a fixed mass of an ideal gas.
- Solution of problems relating to the ideal gas equation.
- Explanation of the deviation of real gases from ideal behaviour at low temperature and high pressure.
- Obtaining and using experimental values to calculate the molar mass of a gas from the ideal gas equation.

- Solution of problems involving molar concentration, amount of solute and volume of solution.
- Use of the experimental method of titration to calculate the concentration of a solution by reference to a standard solution.

Topic 11

- Qualitative data includes all non-numerical information obtained from observations not from measurement.
- Quantitative data are obtained from measurements, and are always associated with random errors/uncertainties, determined by the apparatus, and by human limitations such as reaction times. Propagation of random errors in data processing shows the impact of the uncertainties on the final result.
- Experimental design and procedure usually lead to systematic errors in measurement, which cause a deviation in a particular direction.
- Repeat trials and measurements will reduce random errors but not systematic errors.
- Distinction between random errors and systematic errors.
- Record uncertainties in all measurements as a range (+) to an appropriate precision.
- Discussion of ways to reduce uncertainties in an experiment.
- Propagation of uncertainties in processed data, including the use of percentage uncertainties.
- Discussion of systematic errors in all experimental work, their impact on the results and how they can be reduced.
- Estimation of whether a source of error is likely to have a major or minor effect on the final result.
- Calculation of percentage error when the experimental result can be compared with a theoretical or accepted result.
- Distinction between accuracy and precision in evaluating results. Graphical techniques are an effective means of communicating the effect of an independent variable on a dependent variable and can lead to determination of physical quantities.

- Sketched graphs have labelled but unscaled axes, and are used to show qualitative trends, such as variables that are proportional or inversely proportional.
- Drawn graphs have labelled and scaled axes and are used in quantitative measurements.
- Drawing graphs of experimental results including the correct choice of axes and scale.
- Interpretation of graphs in terms of the relationships of dependent and independent variables.
- Production and interpretation of best-fit lines or curves through data points, including an assessment of when it can and cannot be considered as a linear function.
- Calculation of quantities from graphs by measuring slope (gradient) and intercept, including appropriate units. The degree of unsaturation or index of hydrogen deficiency (IHD) can be used to determine from a molecular formula the number of rings or multiple bonds in a molecule.
- Mass spectrometry (MS), proton nuclear magnetic resonance spectroscopy (1HNMR) and infrared spectroscopy (IR) are techniques that can be used to help identify compounds and to determine their structure.
- Determination of the IHD from a molecular formula.
- Deduction of information about the structural features of a compound from percentage composition data, MS, 1H NMR or IR.

Transfer goals

- Friction, microwaves (physics)
- Physics topic 5.1—electrostatics
- Biology topics 2.2, 2.3, 2.4 and 2.6—understanding of intermolecular forces to work with molecules in the body
- Biology topic 2.2—water
- Designing the structure of a medicinal molecule, so that it can match the functional part of the wanted object in a human body

- Moral, ethical, social, economic and environmental implications of ozone depletion and its solution.
- Organic molecules
- Option A.6—use of metals in nanotechnology

Student Action

- Class discussions
- Class assignments
- Laboratory work (e.g. Modelling molecules with modelling kits, Stoichiometries related laboratory assignments with propagation of errors)
- Usage of databases
- Usage of simulations (Orbitron: hybrid orbitals)

Assessment

- Oral feedback is given throughout the unit
- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile

Inquirers, Knowledgeable, Thinkers: The topic is based on experiments, in which the skills for inquiry and research are important. Analysing the experiments as a whole requires deepened understanding about the theory behind and the used methods. Error propagation is introduced as required part of the IA.

TOK links

Electromagnetic waves can transmit information beyond that of our sense perceptions. What are the limitations of sense perception as a way of knowing?

Unit	Unit 3: Topics 5, 6, 15 and 16 from IBDP Chemistry Syllabus
Level	Higher Level and Standard Level

Essential Understandings

Topic5

- Heat is a form of energy.
- Temperature is a measure of the average kinetic energy of the particles.
- Total energy is conserved in chemical reactions.
- Chemical reactions that involve transfer of heat between the system and the surroundings are described as endothermic or exothermic.
- The enthalpy change (ΔH) for chemical reactions is indicated in kJ mol-1.
- ΔH-values are usually expressed under standard conditions, given by ΔH°, including standard states.
- Calculation of the heat change when the temperature of a pure substance is changed using q=c$m\Delta T$.
- A calorimetry experiment for an enthalpy of reaction should be covered and the results evaluated.
- The enthalpy change for a reaction that is carried out in a series of steps is equal to the sum of the enthalpy changes for the individual steps.
- Application of Hess's Law to calculate enthalpy changes.
- Determination of the enthalpy change of a reaction that is the sum of multiple reactions with known enthalpy changes.
- Hess's Law has significance in the study of nutrition, drugs, and Gibbs free energy where direct synthesis from constituent elements is not possible.
- Bond-forming releases energy and bond-breaking requires energy.
- Average bond enthalpy is the energy needed to break one mol of a bond in a gaseous molecule averaged over similar compounds.

- Calculation of the enthalpy changes from known bond enthalpy values and comparison of these to experimentally measured values.
- Sketching and evaluation of potential energy profiles in determining whether reactants or products are more stable and if the reaction is exothermic or endothermic.
- Discussion of the bond strength in ozone relative to oxygen in its importance to the atmosphere.

Topic 15 (HL only)

- Representative equations (eg M+(g)[Symboli]M+(aq)) can be used for enthalpy/energy of hydration, ionization, atomization, electron affinity, lattice, covalent bond and solution.
- Enthalpy of solution, hydration enthalpy and lattice enthalpy are related in an energy cycle.
- Construction of Born-Haber cycles for group 1 and 2 oxides and chlorides.
- Construction of energy cycles from hydration, lattice and solution enthalpy.
- Calculation of enthalpy changes from Born-Haber or dissolution energy cycles.
- Relate size and charge of ions to lattice and hydration enthalpies.
- Entropy (S) refers to the distribution of available energy among the particles. The more ways the energy can be distributed the higher the entropy.
- Gibbs free energy (G) relates the energy that can be obtained from a chemical reaction to the change in enthalpy (ΔH), change in entropy (ΔS), and absolute temperature(T).
- Entropy of gas>liquid>solid under same conditions.
- Prediction of whether a change will result in an increase or decrease in entropy by considering the states of the reactants and products.
- Calculation of entropy changes (ΔS) from given standard entropy values (S°).

- Application of $\Delta G° = \Delta H° - T\Delta S°$ in predicting spontaneity and calculation of various conditions of enthalpy and temperature that will affect this.
- Relation of ΔG to position of equilibrium.
- T6
- Species react as a result of collisions of sufficient energy and proper orientation.
- The rate of reaction is expressed as the change in concentration of a particular reactant/product per unit time.
- Concentration changes in a reaction can be followed indirectly by monitoring changes in mass, volume and colour.
- Activation energy is the minimum energy that colliding molecules need in order to have successful collisions leading to a reaction.
- By decreasing, a catalyst increases the rate of a chemical reaction, without itself being permanently chemically changed.
- Description of the kinetic theory in terms of the movement of particles whose average kinetic energy is proportional to temperature in Kelvin.
- Analysis of graphical and numerical data from rate experiments.
- Explanation of the effects of temperature, pressure/concentration and particle size on the rate of reaction.
- Construction of Maxwell–Boltzmann energy distribution curves to account for the probability of successful collisions and factors affecting these, including the effect of a catalyst.
- Investigation of rates of reaction experimentally and evaluation of the results.
- Sketching and explanation of energy profiles with and without catalysts

Topic 16 (HL only)

- Reactions may occur by more than one step and the slowest step determines the rate of reaction (rate determining step/RDS).
- The molecularity of an elementary step is the number of reactant particles taking part in that step.

- The order of a reaction can be either integer or fractional in nature. The order of a reaction can describe, with respect to a reactant, the number of particles taking part in the rate-determining step.
- Rate equations can only be determined experimentally.
- The value of the rate constant (k) is affected by temperature and its units are determined from the overall order of the reaction.
- Catalysts alter a reaction mechanism, introducing a step with lower activation energy.
- Deduction of the rate expression for an equation from experimental data and solving problems involving the rate expression.
- Sketching, identifying, and analysing graphical representations for zero, first and second order reactions.
- Evaluation of proposed reaction mechanisms to be consistent with kinetic and stoichiometric data. The Arrhenius equation uses the temperature dependence of the rate constant to determine the activation energy.
- A graph of 1/T against lnk is a linear plot with gradient – Ea/ Rand intercept, lnA
- The frequency factor (or pre-exponential factor) (A) takes into account the frequency of collisions with proper orientations. Analysing the graphical representation of the Arrhenius equation in its linear form lnk=
- Using the Arrhenius equation k=
- Describing the relationships between temperature and rate constant; frequency factor and complexity of molecules colliding.
- Determining and evaluating values of activation energy and frequency factors from data.

Transfer goals

- Hess's Law has significance in the study of nutrition, drugs, and Gibbs free energy where direct synthesis from constituent elements is not possible.

- Determining energy content of important substances in food and fuels
- The flashing light of fireflies is produced by a chemical process involving enzymes.
- The relationship between the "lock and key" hypothesis of enzymes and the Arrhenius equation
- To reduce environmental impact of production recycling of materials is often the most efficient way.

Student Action

- Class discussions
- Class assignments
- Laboratory work (e.g. single replacement reactions in aqueous solutions, enthalpy of combustion of propane or butane, enthalpy changes using calorimeter[Symboli] Hess' law, The catalyst's effect on the rate of reaction, The factor effecting the rate of reaction, determination of the order of reaction (HL) optional!)
- Usage of databases
- Usage of simulations

Assessment (summative and formative)

- Oral feedback is given throughout the unit
- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile

- Thinkers, Communicators: Discuss the source of accepted values and use this idea to critique experiments.
- Open-minded: the pollution that causes stratospheric ozone depletion comes from a variety of regions and sources but is a particular concern in the polar regions of the planet. Global problems need global action.

TOK links

- What criteria do we use in judging discrepancies between experimental and theoretical values?
- Which ways of knowing do we use when assessing experimental limitations and theoretical assumptions?
- Entropy is a technical term which has a precise meaning. How important are technical terms in different areas of knowledge?
- Hess's Law is an example of the application of the Conservation of Energy. What are the challenges and limitations of applying general principles to specific instances to gain knowledge?

Unit	Unit 4: Topics 7,8,17 and 18 from the IBDP Chemistry Syllabus
Level	Higher Level and Standard Level

Essential Understandings

Topic 7

- A state of equilibrium is reached in a closed system when the rates of the forward and reverse reactions are equal.
- The equilibrium law describes how the equilibrium constant (Kc) can be determined for a particular chemical reaction.
- The magnitude of the equilibrium constant indicates the extent of a reaction at equilibrium and is temperature dependent.
- The reaction quotient (Q) measures the relative amount of products and reactants present during a reaction at a particular point in time.
- Q is the equilibrium expression with non-equilibrium concentrations. The position of the equilibrium changes with changes in concentration, pressure, and temperature.
- A catalyst has no effect on the position of equilibrium or the equilibrium constant.
- The characteristics of chemical and physical systems in a state of equilibrium.

- Deduction of the equilibrium constant expression (Kc) from an equation for a homogeneous reaction.
- Determination of the relationship between different equilibrium constants (Kc) for the same reaction at the same temperature.
- Application of Le Châtelier's principle to predict the qualitative effects of changes of temperature, pressure and concentration on the position of equilibrium and on the value of the equilibrium constant.

Topic 8

- A Brønsted–Lowry acid is a proton/H+donor and a Brønsted–Lowry base is a proton/H+acceptor.
- Amphiprotic species can act as both Brønsted–Lowry acids and bases.
- A pair of species differing by a single proton is called a conjugate acid-base pair.
- Deduction of the Brønsted–Lowry acid and base in a chemical reaction.
- Deduction of the conjugate acid or conjugate base in a chemical reaction.
- Most acids have observable characteristic chemical reactions with reactive metals, metal oxides, metal hydroxides, hydrogen carbonates and carbonates.
- Salt and water are produced in exothermic neutralization reactions.
- Balancing chemical equations for the reaction of acids.
- Identification of the acid and base needed to make different salts.
- Candidates should have experience of acid-base titrations with different indicators.
- H=−log[H+(aq)] and [H+]=10−pH.
- A change of one pH unit represents a 10-fold change in the hydrogen ion concentration
- pH values distinguish between acidic, neutral and alkaline solutions.
- The ionic product constant, Kw=[H+][OH−]=10−14at 298 K.

- Solving problems involving pH, [H+]and[OH−]
- The use of a pH meter and universal indicator.
- Strong and weak acids and bases differ in the extent of ionization.
- Strong acids and bases of equal concentrations have higher conductivities than weak acids and bases.
- A strong acid is a good proton donor and has a weak conjugate base.
- A strong base is a good proton acceptor and has a weak conjugate acid.
- Distinction between strong and weak acids and bases in terms of the rates of their reactions with metals, metal oxides, metal hydroxides, metal hydrogen carbonates and metal carbonates and their electrical conductivities for solutions of equal concentrations.
- Rain is naturally acidic because of dissolved CO2 and has a pH of 5.6. Acid deposition has a pH below 5.6.
- Acid deposition is formed when nitrogen or sulfur oxides dissolve in water to form HNO3, HNO2, H2SO4 and H2SO3
- Sources of the oxides of sulfur and nitrogen and the effects of acid deposition should be covered.
- Balancing the equations that describe the combustion of sulfur and nitrogen to their oxides and the subsequent formation of H2SO3, H2SO4, HNO2and HNO3.
- Distinction between the pre-combustion and post-combustion methods of reducing sulfur oxides emissions.
- Deduction of acid deposition equations for acid deposition with reactive metals and carbonates

Topic 17 (HL only)

- Le Châtelier's principle for changes in concentration can be explained by the equilibrium law.
- The position of equilibrium corresponds to a maximum value of entropy and a minimum in the value of the Gibbs free energy.

- The Gibbs free energy change of a reaction and the equilibrium constant can both be used to measure the position of an equilibrium reaction and are related by the equation $\Delta G=-RT\ln K$
- Solution of homogeneous equilibrium problems using the expression for Kc.
- Relationship between ΔG and the equilibrium constant.
- Calculations using the equation $\Delta G=-RT\ln K$

Topic 18 (HL only)

- A Lewis acid is a lone pair acceptor and a Lewis base is a lone pair donor.
- When a Lewis base reacts with a Lewis acid a coordinate bond is formed.
- A nucleophile is a Lewis base and an electrophile is a Lewis acid.
- Application of Lewis' acid-base theory to inorganic and organic chemistry to identify the role of the reacting species.
- The expression for the dissociation constant of a weak acid (Ka) and a weak base (Kb).
- For a conjugate acid base pair, Ka× Kb= Kw.
- The relationship between Ka and pKa is (pKa= -logKa), and between Kb and pKb is (pKb= -log Kb).
- Solution of problems involving [H+(aq)], [OH–(aq)], pH, pOH, Ka, pKa, Kb and pKb
- The relative strengths of acids and bases using values of Ka, pKa,Kb and pKb
- The characteristics of the pH curves produced by the different combinations of strong and weak acids and bases.
- An acid-base indicator is a weak acid or a weak base where the components of the conjugate acid-base pair have different colours.
- The relationship between the pH range of an acid-base indicator, which is a weak acid, and its pKa value.
- The buffer region on the pH curve represents the region where small additions of acid or base result in little or no change in pH.
- The composition and action of a buffer solution.

- The general shapes of graphs of pH against volume for titrations involving strong and weak acids and bases with an explanation of their important features.
- Selection of an appropriate indicator for a titration, given the equivalence point of the titration and the end point of the indicator.
- While the nature of the acid-base buffer always remains the same, buffer solutions can be prepared by either mixing a weak acid/base with a solution of a salt containing its conjugate, or by partial neutralization of a weak acid/base with a strong acid/base.
- Prediction of the relative pH of aqueous salt solutions formed by the different combinations of strong and weak acid and base.

Transfer goals

- Industrial processes
- Option B.2—amino acids acting as amphiprotic species
- Option D.4—antacids are bases which neutralize excess hydrochloric acid in the stomach
- Options B.7 and D.4—buffers
- A number of acids and bases are used in our everyday life from rust removers to oven leaners, from foods to toothpastes, from treatments for bee stings to treatment of wasp stings.
- Option B.2—pH change and enzyme activity
- Environmental systems and societies topic 5.8—acid deposition
- Geography Option G: Urban Environments—urban stress and the sustainable city; HL—Global interactions—environmental change
- The concept of a closed system in dynamic equilibrium can be applied to a range of systems in the biological, environmental and human sciences

Student Action

- Class discussions
- Class assignments
- Laboratory work (e.g. Investigation using Le Chatelier's principle, determination of equilibrium constant and finding out if the

reaction has reached eqm. differing of the weak and the strong acids/bases, titration curves with different options (eg. strong acid and weak/strong base, making a buffer solution)
- Usage of databases
- Usage of simulations

Assessment (summative and formative)
- Oral feedback is given throughout the unit
- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile
- Inquirers: The factors affecting the chemical equilibrium.
- Balanced: Benefits of equilibrium in both the micro and the macro scale.

TOK links
- Many problems in science can only be solved when assumptions are made which simplify the mathematics. What is the role of intuition in problem solving?
- All rain is acidic but not all rain is "acid rain". Scientific terms have a precise definition. Does scientific vocabulary simply communicate our knowledge in a neutral way or can it have value-laden terminology?

Unit	Unit 5: Topics 9 and 19 from IBDP Chemistry Syllabus
Level	Higher Level and Standard Level

Essential Understandings

Topic 9

- Oxidation and reduction can be considered in terms of oxygen gain/hydrogen loss, electron transfer or change in oxidation number.
- An oxidizing agent is reduced and a reducing agent is oxidized.
- Variable oxidation numbers exist for transition metals and for most main-group non-metals.
- The activity series ranks metals according to the ease with which they undergo oxidation.
- The Winkler Method can be used to measure biochemical oxygen demand (BOD), used as a measure of the degree of pollution in a water sample.
- Deduction of the oxidation states of an atom in an ion or a compound.
- Deduction of the name of a transition metal compound from a given formula, applying oxidation numbers represented by Roman numerals.
- Identification of the species oxidized and reduced and the oxidizing and reducing agents, in redox reactions.
- Deduction of redox reactions using half-equations in acidic or neutral solutions.
- Deduction of the feasibility of a redox reaction from the activity series or reaction data. Solution of a range of redox titration problems.
- Application of the Winkler Method to calculate BOD.
- Voltaic (Galvanic) cells: Voltaic cells convert energy from spontaneous, exothermic chemical processes to electrical energy.
- Oxidation occurs at the anode (negative electrode) and reduction occurs at the cathode (positive electrode) in a voltaic cell.
- Electrolytic cells: Electrolytic cells convert electrical energy to chemical energy, by bringing about non-spontaneous processes.
- Oxidation occurs at the anode (positive electrode) and reduction occurs at the cathode (negative electrode) in an electrolytic cell.

- Construction and annotation of both types of electrochemical cells.
- Explanation of how a redox reaction is used to produce electricity in a voltaic cell and how current is conducted in an electrolytic cell.
- Distinction between electron and ion flow in both electrochemical cells.
- Performance of laboratory experiments involving a typical voltaic cell using two metal/metal-ion half-cells.
- Deduction of the products of the electrolysis of a molten salt.

Topic 19 (Higher Level only)

- The voltaic cell generates an electromotive force (EMF) resulting in the movement of electrons from the anode (negative electrode) to the cathode (positive electrode) via the external circuit. The EMF is termed the cell potential (E°)
- The standard hydrogen electrode (SHE) consists of an inert platinum electrode in contact with 1 mol dm-3 hydrogen ion and hydrogen gas at 100 kPa and 298 K. The standard electrode potential (E°) is the potential (voltage) of the reduction half-equation under standard conditions measured relative to the SHE. Solute concentration is 1 mol dm-3 or 100 kPa for gases. E° of the SHE is 0 V.
- When aqueous solutions are electrolysed, water can be oxidized to oxygen at the anode and reduced to hydrogen at the cathode.
- When E° is positive, [Symboli]G° is negative indicative of a spontaneous process. When E° is negative, [Symboli]G° is positive indicative of a non-spontaneous process. When E° is 0, then [Symboli]G° is.
- Current, duration of electrolysis and charge on the ion affect the amount of product formed at the electrodes during electrolysis.
- Electroplating involves the electrolytic coating of an object with a metallic thin layer.
- Calculation of cell potentials using standard electrode potentials.

- Prediction of whether a reaction is spontaneous or not using Eo values.
- Determination of standard free-energy changes (ΔGo) using standard electrode potentials.
- Explanation of the products formed during the electrolysis of aqueous solutions.
- Perform lab experiments that could include single replacement reactions in aqueous solutions.
- Determination of the relative amounts of products formed during electrolytic processes.
- Explanation of the process of electroplating.

Transfer goals

- Many electrochemical cells can act as energy sources alleviating the world's energy problems but some cells such as super-efficient microbial fuel cells (MFCs) (also termed biological fuel cells) can contribute to clean-up of the environment.
- How national governments and the international community decide on research priorities for funding purposes.
- Biology option B.3—environmental protection; waste treatment and microbial fuel Cells
- Although the hydrogen fuel cell is considered an environmentally friendly, efficient alternative to the internal combustion engine, storage of hydrogen fuel is a major problem.
- The use of liquid methanol, which can be produced from plants as a carbon neutral fuel (one which does not contribute to the greenhouse effect), in fuel cells has enormous potential.
- What are the current barriers to the development of fuel cells?

Student Action

- Class discussions
- Class assignments
- Laboratory work (Investigating transition metals using redox titrations, Electrolysis related experiment)
- Usage of databases
- Usage of simulations

Assessment (summative and formative)

- Oral feedback is given throughout the unit
- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile

Principled: The environmental issues related to redox phenomena are a significant part of the unit.

TOK links

- Is energy just an abstract concept used to justify why certain types of changes are always associated with each other? Are concepts such as energy real?

Unit	Unit 6: Topics 10, 20, 11 and 21 from IBDP Chemistry Syllabus
Level	Higher Level and Standard Level

Essential Understandings

Topic 10

- A homologous series is a series of compounds of the same family, with the same general formula, which differ from each other by a common structural unit.
- The difference between full and condensed structural format.
- Structural isomers are compounds with the same molecular formula but different arrangements of atoms.
- And identify functional groups as the reactive parts of molecules.
- The difference: Saturated compounds contain single bonds only and unsaturated compounds contain double or triple bonds.
- Benzene is an aromatic, unsaturated hydrocarbon.

- Explanation of the trends in boiling points of members of a homologous series.
- Distinction between empirical, molecular and structural formulas.
- Identification of different classes: alkanes, alkenes, alkynes, halogenoalkanes, alcohols, ethers, aldehydes, ketones, esters, carboxylic acids, amines, amides, nitriles and arenes.
- Identification of typical functional groups in molecules eg phenyl, hydroxyl, carbonyl, carboxyl, carboxamide, aldehyde, ester, ether, amine, nitrile, alkyl, alkenyl and alkynyl.
- Construction of 3-D models (real or virtual) of organic molecules.
- Application of IUPAC rules in the nomenclature of straight-chain and branched chain isomers.
- Identification of primary, secondary and tertiary carbon atoms in halogenoalkanes and alcohols and primary, secondary and tertiary nitrogen atoms in amines.
- Discussion of the structure of benzene using physical and chemical evidence
- Reactions in different classes and the reaction mechanism involved

Topic 20 (Higher Level only)

- Nucleophilic Substitution Reactions:
- SN1 represents a nucleophilic unimolecular substitution reaction and SN2 represents a nucleophilic bimolecular substitution reaction. SN1 involves a carbocation intermediate. SN2 involves a concerted reaction with a transition state.
- For tertiary halogenoalkanes the predominant mechanism is SN1 and for primary halogenoalkanes it is SN2. Both mechanisms occur for secondary halogenoalkanes.
- The rate determining step (slow step) in an SN1 reaction depends only on the concentration of the halogenoalkane, rate = k[halogenoalkane]. For SN2, rate = k[halogenoalkane][nucleophile]. SN2 is stereospecific with an inversion of configuration at the carbon.

- SN2 reactions are best conducted using aprotic, non-polar solvents and SN1 reactions are best conducted using protic, polar solvents. Electrophilic Addition Reactions:
- An electrophile is an electron-deficient species that can accept electron pairs from a nucleophile. Electrophiles are Lewis acids
- Markovnikov's rule can be applied to predict the major product in electrophilic addition reactions of unsymmetrical alkenes with hydrogen halides and interhalogens. The formation of the major product can be explained in terms of the relative stability of possible carbocations in the reaction mechanism.
- Electrophilic Substitution Reactions:
- Benzene is the simplest aromatic hydrocarbon compound (or arene) and has a delocalized structure of π bonds around its ring. Each carbon to carbon bond has a bond order of 1.5. Benzene is susceptible to attack by electrophiles. Reduction Reactions:
- Carboxylic acids can be reduced to primary alcohols (via the aldehyde). Ketones can be reduced to secondary alcohols. Typical reducing agents are lithium aluminium hydride (used to reduce carboxylic acids) and sodium borohydride. Applications and skills: Nucleophilic Substitution Reactions:
- Explanation of why hydroxide is a better nucleophile than water.
- Deduction of the mechanism of the nucleophilic substitution reactions of halogenoalkanes with aqueous sodium hydroxide in terms of SN1 and SN2 mechanisms. Explanation of how the rate depends on the identity of the halogen (ie the leaving group), whether the halogenoalkane is primary, secondary or tertiary and the choice of solvent.
- Outline of the difference between protic and aprotic solvents. Electrophilic Addition Reactions:
- Deduction of the mechanism of the electrophilic addition reactions of alkenes with halogens/interhalogens and hydrogen halides.
- Electrophilic Substitution Reactions:

- Deduction of the mechanism of the nitration (electrophilic substitution) reaction of benzene (using a mixture of concentrated nitric acid and sulfuric acid).
- Reduction Reactions: Writing reduction reactions of carbonyl-containing compounds: aldehydes and ketones to primary and secondary alcohols and carboxylic acids to aldehydes, using suitable reducing agents.
- Conversion of nitrobenzene to phenylamine via a two-stage reaction. Guidance: Reference should be made to heterolytic fission for SN1 reactions.
- The difference between homolytic and heterolytic fission should be understood.
- The difference between curly arrows and fish-hooks in reaction mechanisms should be emphasized.
- Use of partial charges (δ+ and δ-) and wedge-dash three-dimensional representations (using tapered bonds as shown below) should be encouraged where appropriate in explaining reaction mechanisms.
- Typical conditions and reagents of all reactions should be known (e.g. catalysts, reducing agents, reflux etc.). However, more precise details such as specific temperatures need not be included.
- The synthesis of an organic compound stems from a readily available starting material via a series of discrete steps. Functional group interconversions are the basis of such synthetic routes.
- Retro-synthesis of organic compounds. Deduction of multi-step synthetic routes given starting reagents and the product(s).
- Stereoisomers are subdivided into two classes—conformational isomers, which interconvert by rotation about a σ bond and configurational isomers that interconvert only by breaking and reforming a bond.
- Configurational isomers are further subdivided into cis-trans and E/Z isomers and optical isomers.
- Cis-trans isomers can occur in alkenes or cycloalkanes (or heteroanalogues) and differ in the positions of atoms (or groups)

relative to a reference plane. According to IUPAC, E/Z isomers refer to alkenes of the form R1R2C=CR3R4 (R1 ≠ R2, R3 ≠ R4) where neither R1 nor R2 need be different from R3 or R4.

- A chiral carbon is a carbon joined to four different atoms or groups.
- An optically active compound can rotate the plane of polarized light as it passes through a solution of the compound. Optical isomers are enantiomers. Enantiomers are non-superimposable mirror images of each other. Diastereomers are not mirror images of each other.
- A racemic mixture (or racemate) is a mixture of two enantiomers in equal amounts and is optically inactive. Applications and skills:
- Construction of 3-D models (real or virtual) of a wide range of stereoisomers.
- Explanation of stereoisomerism in non-cyclic alkenes and C3 and C4 cycloalkanes
- Comparison between the physical and chemical properties of enantiomers.
- Description and explanation of optical isomers in simple organic molecules.
- Distinction between optical isomers using a polarimeter.

Topic 11

- The degree of unsaturation or index of hydrogen deficiency (IHD) can be used to determine from a molecular formula the number of rings or multiple bonds in a molecule.
- Mass spectrometry (MS), proton nuclear magnetic resonance spectroscopy (1H NMR) and infrared spectroscopy (IR) are techniques that can be used to help identify compounds and to determine their structure.
- Determination of the IHD from a molecular formula.
- Deduction of information about the structural features of a compound from percentage composition data, MS, 1H NMR or IR.

Topic 21 (Higher Level only)

- Structural identification of compounds involves several different analytical techniques including IR, 1H NMR and MS.
- In a high resolution 1H NMR spectrum, single peaks present in low resolution can split into further clusters of peaks.
- The structural technique of single crystal X-ray crystallography can be used to identify the bond lengths and bond angles of crystalline compounds. Applications and skills:
- Explanation of the use of tetramethylsilane (TMS) as the reference standard.
- Deduction of the structure of a compound given information from a range of analytical characterization techniques (X-ray crystallography, IR, 1H NMR and

Transfer goals

- Physics Option A.5 – materials and polymers. Option B.10 – stereochemistry in biomolecules. Option D.7 – importance of chirality and drug action.
- Biology Options B.2 and B.7 – proteins . Option B.10 – stereochemistry in biomolecules. Option D.9 – organic structure in medicines. Option D.7 – importance of chirality and drug action.
- Fractional distillation makes great use of many petrochemical products for consumption: Dyes, pesticides, herbicides, explosives, soap, cosmetics, synthetic scents and flavourings, like esters —perfumes, food flavourings, solvents, nitroglycerin, biofuels and painkillers.

Student Action

- Class discussions
- Class assignments
- Laboratory work (eg. Investigating transition metals using redox titrations, and function as catalysts, Preparing of aspirin)
- Usage of databases
- Usage of simulations

Assessment (summative and formative)

- Oral feedback is given throughout the unit

- MQ and short questions from early exams for testing "are you on the track?"
- As a part of mock exam

Learner Profile

Balanced: Using interesting media of actual themes that involve organic chemistry.

TOK links

- The label "organic chemistry" originates from a misconception that a vital force was needed to explain the chemistry of life. Can you think of examples where vocabulary has developed from similar misunderstandings? Can and should language ever be controlled to eliminate such problems?
- Stereoisomerism can be investigated by physical and computer models. What is the role of such models in other areas of knowledge?

Unit	Unit 7: Option
Level	Higher Level and Standard Level

Option is decided by each group from each of the following:

A Materials
B Biochemistry
C Energy
D Medicinal Chemistry

Detailed curriculum is delivered in the beginning of the unit.

Teachers: Jukka Hiltunen

Aims

- To acquire the knowledge and understandings of environmental systems at a variety of scales
- To apply the knowledge, methodologies and skills to analyse environmental systems and issues at a variety of scales
- Ao appreciate the dynamic interconnectedness between environmental systems and societies
- To value the combination of personal, local and global perspectives in making informed decisions and taking responsible actions on environmental issues
- To be critically aware that resources are finite, and that these could be inequitably distributed and exploited, and that management of these inequities is the key to sustainability
- To develop awareness of the diversity of environmental value systems
- To develop critical awareness that environmental problems are caused and solved by decisions made by individuals and societies that are based on different areas of knowledge
- To engage with the controversies that surround a variety of environmental issues
- To create innovative solutions to environmental issues by engaging actively in local and global contexts.

Unit	Unit 1: Foundations of ESS, ecosystems and ecology
Level	Standard Level

Foundations of environmental systems and societies:
1.1 Environmental value systems
1.2 Systems and models

1.3 Energy and equilibria

Ecosystems and ecology:
2.1 Species and populations
2.2 Communities and ecosystems
2.3 Flows of energy and matter

Essential Understandings

- Historical events, among other influences, affect the development of environmental value systems (EVSs) and environmental movements.
- A systems approach can help in the study of complex environmental issues.
- The laws of thermodynamics, states of systems, feedback mechanisms.
- Species interactions, Population dynamics, carrying capacity.
- Energy and nutrient flows
- Human impact on energy and matter flows
- Photosynthesis and respiration
- Food chains, food webs and ecological pyramids

Transfer goals

- Discuss: The view that the environment can have its own intrinsic value. Resilience in a variety of systems. Human impacts on energy flows, and on the carbon and nitrogen cycles
- Evaluate: The implications of two contrasting EVSs in the context of given environmental issues. The use of models as a tool in a given situation, for example, climate change predictions. The possible consequences of tipping points.
- Justify: Using examples and evidence, how historical influences have shaped the development of the modern environmental movement. Differences in cultures and societies may influence the development of environmental value systems.

- Construct: A system diagram or a model from a given set of information. Models of feeding relationships—such as food chains, food webs and ecological pyramids—from given data.
- Explain: The implications of the laws of thermodynamics to ecological systems. Population growth curves in terms of numbers and rates. The transfer and transformation of energy as it flows through an ecosystem. The relevance of the laws of thermodynamics to the flow of energy through ecosystems. The impact of a persistent or non-biodegradable pollutant in an ecosystem.
- Interpret: Graphical representations or models of factors that affect an organism's niche. Examples include predator–prey relationships, competition, and organism abundance over time.
- Analyse: The efficiency of energy transfers through a system.
- Understand: The values of both GPP and NPP from and both GSP and NSP.

Student Action

- Environmental attitudes questionnaire for different gender and age groups.
- Analyzing data and presenting results.
- Drawing conclusions and discussing about them.
- Bottle garden

Assessment

Formative throughout the course based on working skills (excellent, on track, to be concerned).

Learner Profile

- Inquirers: EVS questionnaire. Group presentations on unit issues. Inquiring information individually.
- Knowledgeable: Understanding the implications of two contrasting EVSs in the context of environmental issues.
- Thinkers: Analyzing environmental case studies from different perspectives.

- Risk-Takers: Making EVS questionnaire outside school. Meeting new people and interviewing them.

TOK links

- EVSs shape the way we perceive the environment—which other value systems shape the way we view the world?
- Models are simplified constructions of reality—in the construction of a model, how can we know which aspects of the world to include and which to ignore?
- The laws of thermodynamics are examples of scientific laws—in which ways do scientific laws differ from the laws of human science subjects, such as economics?
- Through the use of specialized vocabulary, is the shaping of knowledge more dramatic in some areas of knowledge compared to others?
- Feeding relationships can be represented by different models—how can we decide when one model is better than another?
- The Sun's energy drives energy flows, and throughout history there have been "myths" about the importance of the Sun—what role can mythology and anecdotes play in the passing on of scientific knowledge?

Unit	Unit 2 Biodiversity and conservation; water and food production systems and societies
Level	Standard Level

Biodiversity and conservation / Ecology
2.4 Biomes, zonation and succession
2.5. Investigating ecosystems
3.1 An introduction to biodiversity
3.2 Origins of biodiversity
3.3 Threats to biodiversity
3.4 Conservation of biodiversity

Water food production systems and society
4.1 Introduction to water systems
4.2 Access to freshwater
4.3 Aquatic food production systems
4.4 Water pollution

Essential Understandings

- Climate determines the type of biome in a given area, although individual ecosystems may vary due to many local abiotic and biotic factors. Succession leads to climax communities that may vary due to random events and interactions over time. This leads to a pattern of alternative stable states for a given ecosystem. Ecosystem stability, succession and biodiversity are intrinsically linked.
- The description and investigation of ecosystems allows for comparisons to be made between different ecosystems and for them to be monitored, modelled and evaluated over time, measuring both natural change and human impacts. Ecosystems can be better understood through the investigation and quantification of their components.
- Biodiversity can be identified in a variety of forms, including species diversity, habitat diversity and genetic diversity. The ability to both understand and quantify biodiversity is important to conservation efforts. While global biodiversity is difficult to quantify, it is decreasing rapidly due to human activity. Classification of species conservation status can provide a useful tool in the conservation of biodiversity.
- The impact of losing biodiversity drives conservation efforts. The variety of arguments given for the conservation of biodiversity will depend on EVSs. There are various approaches to the conservation of biodiversity, each with associated strengths and limitations.
- The hydrological cycle is a system of water flows and storages that may be disrupted by human activity. The ocean circulatory

system (ocean conveyor belt) influences the climate and global distribution of water (matter and energy).

- The supplies of freshwater resources are inequitably available and unevenly distributed, which can lead to conflict and concerns over water security. Freshwater resources can be sustainably managed using a variety of different approaches.
- Aquatic systems provide a source of food production. Unsustainable use of aquatic ecosystems can lead to environmental degradation and collapse of wild fisheries. Aquaculture provides potential for increased food production.
- Water pollution, both to groundwater and surface water, is a major global problem, the effects of which influence human and other biological systems.

Transfer goals

- Discuss: The impact of climate change on biomes. The usefulness of providing numerical values of species diversity to understanding the nature of biological communities and the conservation of biodiversity. The case histories of three different species: one that has become extinct due to human activity, another that is critically endangered, and a third species whose conservation status has been improved by intervention. Human impact on the hydrological cycle. With reference to a case study, how shared freshwater resources have given rise to international conflict. With reference to a case study, the controversial harvesting of a named species. A case study that demonstrates the impact of aquaculture. the conflict between exploitation, sustainable development and conservation in tropical biomes. The causes of mass extinctions. The factors which could lead to alternative stable states in an ecosystem. The link between ecosystem stability, succession, diversity and human
- Evaluate: Methods to measure at least three abiotic factors in an ecosystem. Methods to investigate the change along an environmental gradient and the effect of a human impact in an ecosystem. Methods for estimating biomass at different trophic

levels in an ecosystem. Methods for measuring or estimating populations of motile and nonmotile organisms. The impact of human activity on the biodiversity of tropical biomes. The success of a given protected area. Different approaches to protecting biodiversity. The strategies that can be used to meet an increasing demand for fresh water. Strategies that can be used to avoid unsustainable fishing. The uses of indicator species and biotic indices in measuring aquatic pollution.

- Construct: Simple identification keys for up to eight species. A hydrological cycle diagram.
- Explain: The distributions, structure, biodiversity and relative productivity of contrasting biomes. The general patterns of change in communities undergoing succession. How plate activity has influenced evolution and biodiversity. The criteria used to design and manage protected areas. The potential value of aquaculture for providing food for future generations. The process and impacts of eutrophication.
- Interpret: Models or graphs related to succession and zonation.
- Analyse: Data for a range of biomes. Water pollution data.
- Distinguish: The roles of r and K selected species in succession. Between biodiversity, diversity of species, habitat diversity and genetic diversity.
- Comment: The relative values of biodiversity data.
- Design and carry out ecological investigations.
- Calculate and interpret data for species richness and diversity.
- Draw: Graphs to illustrate species diversity in a community over time, or between communities.

Student Action

Practical fieldwork on ecosystems. Done in autumn or spring.

Assessment (summative and formative)

- Summative by paper 1. and by evaluating working skills. Graded 1-7.
-

Learner Profile

- Inquirers: Practical fieldwork on ecosystems. Done in autumn or spring.
- Knowledgeable: The usefulness of providing numerical values of species diversity to understanding the nature of biological communities and the conservation of biodiversity.
- Thinkers: Understanding relative values of biodiversity data.

TOK links

- Ecosystems are studied by measuring biotic and abiotic factors—how can you know in advance which of these factors are significant to the study?
- When is quantitative data superior to qualitative data in giving us knowledge about the world?
- Controlled laboratory experiments are often seen as the hallmark of the scientific method, but are not possible in fieldwork—to what extent is the knowledge obtained by observational natural experiment less scientific than the manipulated laboratory experiment?
- The term "biodiversity" has replaced the term "nature" in much literature on conservation issues—does this represent a paradigm shift?
- Diversity index is not a measure in the true sense of a word, but merely a number (index), as it involves a subjective judgment on the combination of two measures: proportion and richness. Are there examples in other areas of knowledge of the subjective use of numbers?
- The theory of evolution by natural selection tells us that change in populations is achieved through the process of natural selection—is there a difference between a convincing theory and a correct one?
- There may be long-term consequences when biodiversity is lost—should people be held morally responsible for the long-term consequences of their actions?

- There are various approaches to the conservation of biodiversity—how can we determine when we should be disposed to act on what we know?
- The hydrological cycle is represented as a systems model—to what extent can systems diagrams effectively model reality, given that they are only based on limited observable features?
- Aid agencies often use emotive advertisements around the water security issue— to what extent can emotion be used to manipulate knowledge and actions?
- The Inuit people have an historical tradition of whaling—to what extent does our culture determine or shape our ethical judgments?
- A wide range of parameters are used to test the quality of water and judgments are made about causes and effects of water quality—how can we effectively identify cause–effect relationships, given that we can only ever observe correlation?

Unit	Unit 3
Level	Standard Level

Topics:
1.4 Sustainability
1.5 Humans and pollution
5. Soil systems and society
6. Atmospheric systems and society

Essential Understandings

- All systems can be viewed through the lens of sustainability.
- Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.

- Environmental indicators and ecological footprints can be used to assess sustainability.
- Environmental impact assessments (EIAs) play an important role in sustainable development.
- Pollution is a highly diverse phenomenon of human disturbance in ecosystems.
- Pollution management strategies can be applied at different levels.
- The soil system is a dynamic ecosystem that has inputs, outputs, storages and flows.
- The sustainability of terrestrial food production systems is influenced by socio-political, economic and ecological factors.
- Fertile soils require significant time to develop through the process of succession.
- Human activities may reduce soil fertility and increase soil erosion.
- The atmosphere is a dynamic system that is essential to life on Earth.
- Stratospheric ozone is a key component of the atmospheric system because it protects living systems from the negative effects of ultraviolet radiation from the Sun.
- Human activities have disturbed the dynamic equilibrium of stratospheric ozone formation.
- The combustion of fossil fuels produces primary pollutants that may generate secondary pollutants and lead to photochemical smog, the levels of which can vary by topography, population density and climate.
- Photochemical smog has significant impacts on societies and living systems.
- Acid deposition can impact living systems and the built environment.
- The pollution management of acid deposition often involves cross-border issues.

Transfer goals

- Discuss: How environmental indicators such as MA can be used to evaluate the progress of a project to increase sustainability. The links that exist between socio-cultural systems and food production systems. The influences of human activities on soil fertility and soil erosion. The role of the albedo effect from clouds in regulating global average temperature.
- Evaluate: Pollution management strategies for acid deposition. The role of national and international organizations in reducing the emissions of ozone-depleting substances. The soil management strategies of a given commercial farming system and of a given subsistence farming system. The use of EIAs. The strategies to increase sustainability in terrestrial food production systems. The role of national and international organizations in reducing the emissions of ozone-depleting substances. pollution management strategies for acid deposition.
- Construct: Systems diagrams to show the impact of pollutants.
- Explain: The relationship between natural capital, natural income and sustainability. How soil can be viewed as an ecosystem. The relationship between soil ecosystem succession and soil fertility.
- Outline: The transfers, transformations, inputs, outputs, flows and storages within soil systems. The role of the greenhouse effect in regulating temperature on Earth.
- Analyse: Tables and graphs that illustrate the differences in inputs and outputs associated with food production systems.
- Compare and contrast: The inputs, outputs and system characteristics for two given food production systems.

Student Action

- Research on DDT.
- Analyse tables and graphs that illustrate the differences in inputs and outputs associated with food production systems.
- Evaluate the environmental impacts on local and global food production systems.

Assessment (summative and formative)

- Summative by paper 1. and by evaluating working skills Graded 1-7.

Learner Profile

- Inquirers: Research on DDT.
- Knowledgeable: Evaluate the environmental impacts on local and global food production systems.
- Thinkers: Understanding the links that exist between socio-cultural systems and food production systems and the influences of human activities on soil fertility and soil erosion.

TOK links

- EIAs incorporate baseline studies before a development project is undertaken—to what extent should environmental concerns limit our pursuit of knowledge? When is quantitative data superior to qualitative data in giving us knowledge about the world?
- Experts sometimes disagree about pollution management strategies—on what basis might we decide between the judgments of the experts if they disagree?
- The soil system may be represented by a soil profile—since a model is, strictly speaking, not real, how can it lead to knowledge? The theory of evolution by natural selection tells us that change in populations is achieved through the process of natural selection—is there a difference between a convincing theory and a correct one?
- Consumer behaviour plays an important role in food production systems—are there general laws that can describe human behaviour?
- Our understanding of soil conservation has progressed in recent years—what constitutes progress in different areas of knowledge?The hydrological cycle is represented as a systems model—to what extent can systems diagrams effectively model reality, given that they are only based on limited observable features?
- The atmosphere is a dynamic system—how should we react when we have evidence that does not fit with an existing

theory? The Inuit people have an historical tradition of whaling—to what extent does our culture determine or shape our ethical judgments?
- The Montreal Protocol was an international agreement created by the UN—can one group or organization decide what is best for the rest of the world?
- Environmental problems are often emotive—under what circumstances should we maintain a detached relationship with the subject matter under investigation?
- To what extent does the recognition of the ethical responsibility of knowledge influence the further production or acquisition of knowledge?

Unit	Unit 4 Climat change and energy production, human systems and resource use
Level	Standard Level

Topics

7. Climate change and energy production
8. Human systems and resource use

Essential Understandings

- There is a range of different energy sources available to societies that vary in their sustainability, availability, cost and socio-political implications.
- The choice of energy sources is controversial and complex. Energy security is an important factor in making energy choices.
- Climate change has been a normal feature of the Earth's history, but human activity has contributed to recent changes.
- There has been significant debate about the causes of climate change.

- Climate change causes widespread and significant impacts on a global scale.
- A variety of models and indicators are employed to quantify human population dynamics.
- Human population growth rates are impacted by a complex range of changing factors
- The renewability of natural capital has implications for its sustainable use.
- The status and economic value of natural capital is dynamic.
- Solid domestic waste (SDW) is increasing as a result of growing human populations and consumption.
- Both the production and management of SDW can have significant influence on sustainability.
- Human carrying capacity is difficult to quantify.
- The EF is a model that makes it possible to determine whether human populations are living within carrying capacity

Transfer goals

- Discuss: The cultural, historical, religious, social, political and economic factors that influence human population dynamics. The use of models in predicting the growth of human populations. Mitigation and adaptation strategies to deal with impacts of climate change. The feedback mechanisms that would be associated with a change in mean global temperature. The factors that affect the choice of energy sources adopted by different societies.
- Evaluate: The application of carrying capacity to local and global human populations. How EVSs impact the EFs of individuals or populations. SDW disposal options. The effectiveness of international climate change talks. Contrasting viewpoints on the issue of climate change. The advantages and disadvantages of different energy sources.
- Explain: The dynamic nature of the concept of natural capital. The nature and implications of growth in human populations.
- Outline: An example of how renewable and non-renewable natural capital has been mismanaged.

- Analyse: The impact that national and international development policies can have on human population dynamics and growth.
- Compare and contrast: The differences in the EF of two countries. Pollution management strategies for SDW.

Student Action

- Evaluate the energy strategies of own country and other named country.
- Evaluate the advantages and disadvantages of different energy sources.
- Evaluate contrasting viewpoints on the issue of climate change.

Assessment (summative and formative)

- Summative by paper 1. and by evaluating working skills Graded 1-7.
- Internal assessment.

Learner Profile

- Knowledgeable: Evaluate advantages and disadvantages of different energy sources.
- Thinkers: Evaluating contrasting viewpoints on the issue of climate change. Evaluate how can we be confident of the ethical responsibilities that may arise from knowledge when that knowledge is often provisional or incomplete?

TOK links

- The choice of energy sources is controversial and complex—how can we distinguish between a scientific claim and a pseudoscience claim when making choices?
- There has been considerable debate about the causes of climate change—does our interpretation of knowledge from the past allow us to reliably predict the future?
- There is a degree of uncertainty in the extent and effect of climate change—how can we be confident of the ethical

responsibilities that may arise from knowledge when that knowledge is often provisional or incomplete?

- A variety of models and indicators are employed to quantify human population dynamics—to what extent are the methods of the human sciences "scientific"?
- The circular economy can be seen as a paradigm shift—does knowledge develop through paradigm shifts in all areas of knowledge?
- Human carrying capacity is difficult to quantify and contains elements of subjective judgment. It has been claimed that historians cannot be unbiased—could the same be said of environmental scientists when making knowledge claims?

PHYSICS

Teachers: Kari Eloranta, Pentti Frondelius

Unit	Unit 1 Measurement and uncertainties
Level	Higher Level and Standard Level

Essential understandings

- Using units and scientific notation in physics.
- Using order of magnitude estimation.
- Finding and quantifying the sources of uncertainties in practical work.
- Analysing data with uncertainties.
- Using vectors both graphically and algebraically in physics.
- Understanding that uncertainties do not make scientific knowledge uncertain.

Transfer goals

- The main goal is to give students an understanding of how experimental uncertainties affect the reliability of data and that uncertainty is part of any measurement.
- Students should appreciate the nature of physical knowledge as a way of describing natural behaviour in quantitative terms.

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs
- Writing work reports

Assessment (summative and formative)

- Formative: questions from the text book
- Summative: integrated with other units.

Learner Profile

How would you implement caring in the context of practical work?

TOK links

- To what extent does uncertainty in measurement render scientific knowledge uncertain?

Unit	Unit 2 Mechanics
Level	Higher Level and Standard Level

Essential understandings

- Difference between average and instantaneous quantities
- Memorising and using kinematic equations
- Objects as point particles

Transfer goals

- Mechanics is present everywhere in our lives. It is especially important in traffic safety, when we have to make justified decisions that affect the lives of citizens.
- The role of mathematics in physics is clearly manifested in Mechanics. By modelling motion in kinematics, the students learn the fundamental modelling skills needed in other areas of knowledge.
- The effect of simplified assumptions in relation to real world phenomena can be applied in all areas of physics. Free fall vs. real fall serves as an excellent example of the limitations of a model.

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs
-

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

Students will ponder how they can implement life-long learning in studying physics.

TOK links

- Many sources argue that one of the key characteristics of scientific knowledge is that it is constantly changing. If scientific knowledge changes all the time, can scientific knowledge ever be certain?

Unit	Unit 3 Thermal Physics
Level	Higher Level and Standard Level

Essential understandings

- Open, closed and isolated thermodynamic systems in terms of state variables.
- Gas laws and ideal gas behavior
- Phase changes, specific and latent heats

Transfer goals

- The role of thermal physics in all areas of physics should be appreciated.
- The idea of system in physics is essential in all fields of physics.

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of unit

Learner Profile

"Imagination is more important than knowledge." – Albert Einstein (1879-1955). How does Einstein's quote relate to an IB student being an inquirer? In this unit, students learn to be inquirers.

TOK links

- To what extent does it make sense to say that thermal physics is an essential area of knowledge in all areas of knowledge?

Unit	Unit 4 Waves
Level	Higher Level and Standard Level

Essential understandings

- The nature of electromagnetic waves
- The wave equation
- Wave diagrams
- General properties of waves
- The behaviour of waves between two media

Transfer goals

- The appreciation of waves also in other areas of physics, such as electricity and magnetism and quantum physics.
- The role of models in physics: are models real?

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

In this unit, the emphasis is on caring. Once you care about, and respect yourself, you are ready to show empathy, compassion and respect towards the needs and feelings of others.

TOK links

- The harmonic oscillator is a paradigm for modelling where a simple equation is used to describe a complex phenomenon. How do scientists know when a simple model is not detailed enough for their requirements of scientific knowledge?

Unit	Unit 5 Electricity and magnetism
Level	Higher Level and Standard Level

Essential understandings

- The operation of technological devices in relation to electricity and magnetism.
- Resistance, resistivity, electric current and electric potential difference.
- The construction of DC circuits and measuring electric currents and electric potential differences in a circuit.

Transfer goals

- The appreciation of electricity as a fundamental area of physics in engineering
- To learn to appreciate technology and approach technology with an open mind

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

How can an IB student be a risk taker and still be aware of hazards relating to electricity? The focus is on the IB learner profile and safety.

TOK links

- To what extent does electricity have implications in other areas of knowledge?

Unit	Unit 6 Circular motion and gravitation
Level	Higher Level and Standard Level

Essential understandings

- The gravitational and electromagnetic fields that fill the Universe
- Uniform circular motion
- Satellite motion, planets and moons
- The universal law of gravitation

Transfer goals

- The nature of scientific research: Brahe-Kepler-Galileo-Newton.
- Funding in science.
- To learn to look at the universe in terms of fields

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

Always take responsibility for your own actions, and the consequences that accompany them. In this unit we pay special attention to how we treat the others.

TOK links

- To what extent can the laws of physics be exact?

Unit	Unit 7 Atomic, nuclear and particle physics
Level	Higher Level and Standard Level

Essential understandings

- The concept of probability
- Types of radioactivity
- Nuclear reactions
- Mass defect
- Decay laws and terminology
- Standard model

Transfer goals

- To appreciate the importance of quantum mechanics in physics
- To appreciate how ordinary matter is mode of only three types of particle and fundamental interactions

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

Creativity is in a central role in all scientific endeavour. Scientific discoveries are a result of hard work and creativity. The concept of serendipity is also considered in relation to creativity.

TOK links

To what extent has quantum mechanics changed the nature of knowledge in science?

Unit	Unit 8 Energy production
Level	Higher Level and Standard Level

Essential understandings

- Renewable and non-renewable energy sources
- Global warming

Transfer goals

- Fact-based forming of opinions as part of humanity
- To understand why it is not that easy to meet the global challenges in energy production

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

By introducing the scientific method and studying physics, we can gain understanding and insight into global issues, such as sustainable growth, and help preserve natural resources.
Science makes understanding other cultures, and different characteristics of human nature, easier – thus helping intercultural communication and friendship.

TOK links

- To what extent should emotions play a role when gathering knowledge for decision making in society?

Unit	Unit 9 Wave phenomena
Level	Higher Level

Essential understandings

- The equations of simple harmonic motion
- Diffraction patterns and intensity graphs
- Interference of waves
- Resolution
- Doppler effect

Transfer goals

- To learn to understand intensity graphs in physics in general.

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

In the first AHL topic we discuss the role of HL students in a learning community from the point of view of the IB learner profile.

TOK links

- To what extent do models play a role in all areas of knowledge?

Unit	Unit 10 Fields
Level	Higher Level

Essential understandings

- Fundamental concepts of field, potential, field strength and potential energy
- The similarities between gravitational end electromagnetic fields
- Radial field
- Inverse square behavior
- Orbital motion, orbital speed and orbital energy

Transfer goals

- Learn to appreciate the inverse square behaviour in all areas of physics
- How fields are fundamental in physics

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

Reflecting on the personal learning process in non-assessed parts of the physics course is equally important. Being constantly aware of the

learning process not only makes the process more effective, but also gives room for development as a human being.

TOK links

- Fields are used in science to explain action at a distance. To what extent are fields used in other areas of knowledge?

Unit	Unit 11 Electromagnetic induction
Level	Higher Level

Essential understandings

- Electromagnetic induction as a natural phenomenon
- Induced emf and current
- Magnetic flux linkage
- Lenz's law
- Power generation, transmission and transformers
- Charging and discharging of capacitors
- Combinations of capacitors

Transfer goals

- Differential calculus in induction and mechanics

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of unit

Learner Profile

Written communication is practised as part of problem solving and in work reports. In this unit, the focus will be on communication.

TOK links

- Differential calculus deals with infinitesimally small quantities. What role do infinities play in scientific knowledge in general?

Unit	Unit 12 Quantum and nuclear physics
Level	Higher Level

Essential understandings

- Photoelectric phenomenon
- Photons and quantum physics
- Quantization of energy
- Matter waves
- Nuclear energy levels

Transfer goals

- The dual nature of matter and electromagnetic interaction

Student Action

- Lecture
- Socratic seminar
- Team work
- Working in pairs

Assessment (summative and formative)

- Formative: questions from the text book and past IB questions
- Summative: test at the end of the unit

Learner Profile

Thinking will be addressed especially in this mind-tweaking unit. Schrödinger's cat is an excellent starting point for a discussion.

TOK links

- Discuss the role of quantum mechanics in the deterministic world view. To what extent has quantum mechanics changed the nature of knowledge in science?

Unit	Unit Option
Level	Higher Level and Standard Level

Student will study one option from the IBDP Physics syllabus. The detailed curriculum will be delivered at the end of the uni

SUBJECT GROUP: MATHEMATICS

Mathematics HL, Mathematics SL, Mathematical Studies SL

Aims

- To enjoy mathematics, and develop an appreciation of the elegance and power of mathematics
- To develop an understanding of the principles and nature of mathematics
- To communicate clearly and confidently in a variety of contexts
- To develop logical, critical and creative thinking, and patience and persistence in problem-solving
- To employ and refine their powers of abstraction and generalization
- To apply and transfer skills to alternative situations, to other areas of knowledge and to future developments
- To appreciate how developments in technology and mathematics have influenced each other
- To appreciate the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics
- To appreciate the international dimension in mathematics through an awareness of the universality of mathematics and its multicultural and historical perspectives
- To appreciate the contribution of mathematics to other disciplines, and as a particular "area of knowledge" in the TOK course.

International–mindedness in the subject group

Mathematics is in a sense an international language, and, apart from slightly differing notation, mathematicians from around the world can communicate within their field. Mathematics transcends politics, religion and nationality, yet throughout history great civilizations owe their success in part to their mathematicians being able to create and maintain complex social and architectural structures.

The importance of science and technology in the everyday world is clear, but the vital role of mathematics is not so well recognized. It is the language of science and underpins most developments in science and technology. A good example of this is the digital revolution, which is transforming the world, as it is all based on the binary number system in mathematics.

Approaches to teaching within the subject group

There will be a great variety of topics studied, and differing approaches to teaching and learning. Throughout the mathematics courses, students are encouraged to develop their understanding of the methodology and practice of the discipline of mathematics. The processes of mathematical inquiry, mathematical modelling and applications and the use of technology is introduced appropriately. These processes are used throughout the course, and not treated in isolation.

Based on inquiry

Inquiry-based approach, starting with practical investigations where possible, followed by analysis of results, leading to the understanding of a mathematical principle and its formulation into mathematical language, are often most successful in engaging the interest of students. Furthermore, this type of approach is likely to assist students in their understanding of mathematics by providing a meaningful context and by leading them to understand more fully how to structure their work for the project and exploration.

Focused on conceptual understanding

Students are encouraged to see the connections between all math topics and to develop their thinking so that they can apply their math skills to a wide variety of problems.

Developed in local and global contexts

For students to function in a local and global context, math content helps them to understand different perspectives and world conditions get to both local and global competence so that they recognize that

issues are interconnected. In mathematics this means showing students how the world consists of situations, events and phenomena that can be sorted out using the right math tools.

Focused on effective teamwork and collaboration

Students will be able to understand the benefits of effective teamwork in the mathematics lessons. Students are given time to work on the problems while the teacher walks around, answers questions and discusses the problems with the students.

Differentiated to meet the needs of all learners

Teaching is flexible and allows different styles of learning. Differentiating instruction may mean teaching the same material to all students using the variety of instructional strategies and different levels of tasks. The use of technology, particularly the graphic display calculator and computer packages, is very useful in allowing students to explore ideas in a rich context.

Informed by assessment (formative and summative)

At the end of the course, students' abilities are measured by means of external assessment.

During the courses students are assessed all the time and they are given instant feedback.

TOK links

- Mathematics and the knower. To what extent should mathematical knowledge be consistent with our intuition?
- Do proofs provide us with completely certain knowledge?
- The nature of mathematics. Has "i" been invented or was it discovered?

CAS links

Students take an active role in our community by tutoring other students.

Promoting research skills in the subject group

During the Statistics course students perform statistical research. Exploration.

MATHEMATICS HL

Teachers: Sinikka Kilpeläinen, Hannele Parkkinen
Last exams in 2020

Unit	Unit 1 Algebra, functions and equations, circular functions and vectors
Level	Higher Level

Essential Understandings

The aim of this unit is to introduce students to some basic algebraic concepts and applications, to explore the notion of function as a unifying theme in mathematics, and to apply functional methods to a variety of mathematical situations. Extensive use will be made of technology in both the development and the application. In addition, the aims are to explore the circular functions, to introduce some important trigonometric identities and to solve triangles using trigonometry. The aim of this unit is also to introduce the use of vectors in two and three dimensions, and to facilitate solving problems involving points, lines and planes.

Transfer goals

Logical thinking, assumptions.

Student Action

Recall, select and use their knowledge of mathematical facts, skills, concepts and techniques in a variety of familiar and unfamiliar contexts as well as real and abstract contexts to solve problem. Use technology.

Assessment (summative and formative)

- At the end of the course, students' abilities are measured by means of external assessment.

- During the courses students are assessed all the time and they are given instant feedback.

Learner Profile

Teaching encourages learning by experimentation, questioning and discovery. Students generally learn mathematics by being active participants in learning activities. Teaching provides students with opportunities to learn through mathematical inquiry. At classrooms is a safe learning environment in which students are comfortable as risk-takers.

TOK links

- How is mathematical intuition used as a basis for formal proof?
- What evidence do we have for the claim that mathematics is simply the manipulation of symbols under a set of formal rules?

Unit	Unit 2 Statistics and probability, calculus
Level	Higher Level

Essential Understandings

The aim of this unit is to introduce basic concepts of statistics and probability. In addition, the aim is to introduce students to the basic concepts and techniques of differential and integral calculus and their application

Transfer goals

Logical thinking, assumptions, research skills.

Student Action

Recall, select and use their knowledge of mathematical facts, skills, concepts and techniques in a variety of familiar and unfamiliar

contexts as well as real and abstract contexts to solve problem. Use technology.

Assessment (summative and formative)

- At the end of the course, students' abilities are measured by means of external assessment.
- During the courses students are assessed all the time and they are given instant feedback.

Learner Profile

Teaching encourages learning by experimentation, questioning and discovery. Students generally learn mathematics by being active participants in learning activities. Teaching provides students with opportunities to learn through mathematical inquiry. At classrooms is a safe learning environment in which students are comfortable as risk-takers.

TOK links

- To what extent can we justify that the knowledge acquired from mathematics is different from statistics?
- Under what circumstances is there a difference between information and data?
- To what extent can use reasoning based on samples of data as a way of knowing?
- To what extent can we trust mathematical models such as the normal distribution?

MATHEMATICS SL

Teachers: Sinikka Kilpeläinen, Hannele Parkkinen
Last exams in 2020

Unit	Unit 1 Algebra, functions and equations, circular functions and vectors
Level	Standard Level

Essential understandings

- To introduce students to some basic algebraic concepts and applications;
- To explore the notion of a function and to apply functional methods to a variety of mathematical situations;
- To provide an elementary introduction to vectors, including both algebraic and geometric approaches.
- Use of technology (graphical calculator)

Transfer goals

- Students select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. They sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology.
- Students investigate unfamiliar situations, both abstract and real-world.

Student Action

- The students work individually but also in the teams.

Assessment (formative and summative)

- The students get spoken feedback every lesson. The summative tests are kept 2-4 times during the unit. The main exam at the end of the unit.

Leaner profile

The students explore concepts, ideas and issues that have local and global significance. They work effectively and creatively with others

TOK links

- To what extent does mathematical understanding require language?
- Is it justifiable to say: "Mathematicians can always trust results based on valid reasoning."?

Unit	Unit 2 Statistics and probability, calculus
Level	Standard Level

Essential understandings

- To introduce basic concepts. The emphasis is on understanding and interpreting the results
- To introduce students to the techniques of differential and integral calculus and their applications.
- Use of technology (graphical calculator)

Transfer goals

- Students select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. They sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology.
- Students investigate unfamiliar situations, both abstract and real-world.

Student Action

The students work individually but also in the teams.

Assessment

The students get spoken feedback every lesson. The summative tests are kept 2-4 times during the unit. The main exam at the end of the unit.

Leaner profile

The students explore concepts, ideas and issues that have local and global
significance. They exercise initiative in applying thinking skills critically and creatively to approach complex problems

TOK links

- To what extent is mathematics a way to describe the real world?
- What is the amount of statistical data needed to determine the reliability of a result?

MATHEMATICAL STUDIES SL

Teachers: Lasse Ikäläinen
Last exams in 2020

Unit	Unit 1 Descriptive statistics; mathematical models; geometry and trigonometry
Level	Standard Level

Description
The aims of this topic are to introduce some basic elements and concepts of mathematics, and to link these to financial and other applications

Essential understandings

- To develop techniques to describe and interpret sets of data, in preparation for further statistical applications;
- To develop understanding of some mathematical functions that can be used to model practical situations;
- To develop the ability to draw clear diagrams in two dimensions, and to apply appropriate geometric and trigonometric techniques to problem-solving in two and three dimensions.

Transfer goals

- The students will have the opportunity to understand and appreciate both the practical use of mathematics and its aesthetic aspects. They will be encouraged to build on knowledge from prior learning in mathematics and other subjects, as well as their own experience. The students develop mathematical intuition and understand how they can apply mathematics in life.

- The students are encouraged to start using collaboration and teamwork as powerful tools in learning mathematics.

Student Action
The students work both individually and in teams solving problems and tasks.

Assessment
The students will be assessed during the course by giving instant feedback, and a summative test is used to measure the students' skills at the end of the unit.

Learner Profile
The students explore concepts, ideas and issues that have local and global significance. They exercise initiative in applying thinking skills critically and creatively to approach also complex problems.

TOK links
To what extent does bias in the data limit the validity of information?
What role does generalization play in mathematical knowledge?
Under what circumstances does a graph without labels or indication of scale have meaning?

Unit	Unit 2 Statistical applications; introduction to differential calculus; logic, sets and probabilit
Level	Standard Level

Description
The aims of this topic are to develop techniques in inferential statistics in order to analyse sets of data, draw conclusions and interpret these

Essential Understandings

- To introduce the concept of the derivative of a function and to apply it to optimization and other problems;
- To introduce the principles of logic, to use set theory to introduce probability, and to determine the likelihood of random events using a variety of techniques;
- To perform a mathematical research and use this exploration as a tool of learning how to use mathematical methods when examining a discrete practical problem.

Transfer goals

- The students will have the opportunity to understand and appreciate both the practical use of mathematics and its aesthetic aspects.
- They will be encouraged to build on knowledge from prior learning in mathematics and other subjects, as well as their own experience.
- The students develop mathematical intuition and understand how they can apply mathematics in life.
- The students will promote their self-management and research skills.

Student Action

The students work both individually and in teams solving problems and tasks. The IA project is an individual effort that takes place during the unit.

Assessment

The students will be assessed during the course by giving instant feedback, and a summative test is used to measure the students' skills at the end of the unit.

Learner Profile

The students explore concepts, ideas and issues that have local and global significance. They exercise initiative in applying thinking skills critically and creatively to approach also complex problems. The

students act with integrity and honesty, with a strong sense of fairness.

TOK links

- Under what circumstances can correlation imply causation?
- Can we reliably use the equation of the regression line to make predictions?