Course outline

SCILIFE101, Introduction to Life Science
Group 1
Fall 2019

SCILIFE101, Introduction to Life Science

Fall 2019

Classroom no:	C-19
Class times:	Monday, 08:45-10:45 Thursday, 13:45-15:45
Instructors:	Prof. Dr. Ger Rijkers Dr. Frans van Overveld
Email:	g.rijkers@ucr.nl f.vanoverveld@ucr.nl
Tel:	0118 - 655500
Office no. & location:	Eleanor 1.04 and 2.02
Office hours:	Mon-Fri, by appointment

I. Track information

a) Prerequisites for this course: none, but Methods & Statistics I (ACCRMET101) and Introduction to Rhetoric & Argumentation (ACCRHET101) are recommended.
b) This course serves as prerequisite for: Biochemistry (SCICHEM202), Molecular Biology and Cell Biology (SCILIFE201), Functional Anatomy (SCIBIOM201), Human Physiology (SCILIFE202), Mechanisms of Disease (SCIBIOM202), Life Science Laboratory (SCILABO201), Cellular and Molecular Physiology (SCILIFE302), Pharmacology (SCIBIOM301), Infection and Immunity (SCIBIOM302), Molecular Pathology and Genetics (SCILIFE301).
c) Other courses which are relevant to this course – e.g. as part of a minor: The course is open to all students. It is the beginning of the Life Science track within the Science framework, but it can also be followed as a stand-alone course for students with another major. However, the level of the course will follow up on the general exam level of high-school biology and chemistry.
Skills and knowledge obtained in the courses Methods & Statistics I (ACCRMET101) and Introduction to Rhetoric & Argumentation (ACCRHET101) are highly recommended. In addition, the science courses History and Philosophy of Science (SCIGNRL104) and Introduction to Physics and Chemistry (SCIPHYS101) may be very useful.

For further information about the track, please see the track document available on the UCR intranet.

II. Course description

This course introduces students to the **fundamental characteristics of life** on earth. All biological life is composed of cells, and all cells come from pre-existing cells. Cells are the basic building blocks of life and its properties can be explained in physical and chemical terms. Cells take in energy and nutrients from their environment and convert it to biologically useful forms. Genetic information in the form of nucleic acids, which encode all cellular activities, is transmitted from one generation to the next. Mutation and recombination of genetic material, however, cause genetic variation, which in turn enables evolution by natural selection. Emphasis will be on concepts in molecular biology, cell biology and physiology that are of high

relevance in biomedical science. The course is divided in 3 units: **The Cell as Unit of Life**, **Basic Molecular Biology**, and **Cellular Physiology and Communication**. In addition, there will be one group assignment.

III. Study Load

This course earns students four credits (equivalent to 7.5 ECTS). The class meets twice a week for two hours. Preparation time is approximately 10 hours per week.

IV. Course materials

a) Required books and literature:

- David E. Sadava, David M. Hillis, H. Craig Heller, Sally D. Hacker. ***Life, The Science of Biology***. 11th Edition 2017. MacMillan Learning. ISBN 13: 978-1-319-01016-4.

b) Recommended books and literature:

- William A.N. Dorland. ***Dorland's Illustrated Medical Dictionary***. 32nd Edition 2011. Elsevier. ISBN 13: 978-1-416-06257-8 (hardcover).

c) Other materials:

- Access to the Medline/Pubmed databases on biomedical scientific literature will be provided via the UU library.

V. Course organization and requirements

a) General format of class meetings

In total 22 interactive classes of two hours will be given on the three major topics: **The cell as unit of life**, **Basic Molecular Biology**, and **Cellular Physiology and Communication**. The instructor will give an introduction and summarize the chapters listed on the detailed course outline (see section VII). This will be done using PowerPoint® presentations and schematic information on the white board. Approximately 150 hours will be necessary to study the indicated chapters in the textbook and to prepare for the classes. The introductions will give a broad overview of the topic and its relation to other topics. Active participation in answering questions, solving problems and explaining concepts to fellow students are part of the introductions. In addition, scientific papers dealing with current 'state of the art' research and concepts will be discussed. The slides presented during the introductions and other useful material, as well as study hints and a discussion board - supervised by the instructor - will be available on the **Moodle** platform.

Mobile phones, laptops and other devices which connect to the internet **must not be used** in class. If you are seen using these devices you will be required to hand in your device at the start of class every session from that point forward (unless the instructor has given permission for use).

Special needs: students with documented learning disabilities or special needs should make their needs known to the instructor at the start of the course.

b) What are we expecting of students

Besides attending classes the student has to study the corresponding chapters of the book before class. In these chapters the student will find extensive descriptive texts, illustrations and useful examples. The level of the course will follow up on the general exam level of high-school biology and chemistry. The students are also expected to study selected scientific papers from a list provided by the instructor. The student (together with 1 or 2 peers, 10/15 min. presentations) will orally present these papers using PowerPoint®, showing a good understanding of the topics discussed and the techniques used in the papers. The presentations will take 2 class meetings (4 hours).

c) Rules for missing classes, exams and deadlines

Class attendance is mandatory. The instructor should be informed **before class** in case of illness or any other urgent reason to excuse class. According to UCR academic rules and procedures, the course is failed when 7 or more of the classes are missed. On Tuesday **December 17**, **late exams** are offered only for those having excused an earlier exam for a valid reason. **No late exams are possible during the semester (= including the Fall break)**.

d) Procedures for communication and use of Moodle

Moodle is the preferred mode of communication. The assignments (slides of the PowerPoint presentations®, score sheets, feedback forms, etc.) should all be posted in the Moodle directories specifically created for this purpose. In general, all work must be uploaded in Moodle. **Work that is not present in Moodle will be considered as not submitted** and will be graded with **F** (fail).

All assignments will be checked for plagiarism using Urkund®. Plagiarism is a serious academic offence which carries heavy sanctions. Make yourself familiar with the UCR Plagiarism Policy (see your Student Handbook).

Outside class, the student may contact the instructors at g.rijkers@ucr.nl and/or f.vanoverveld@ucr.nl. In addition, the instructor has set office hours from Monday to Friday by appointment.

e) Other

This course is subject to UCR academic rules and procedures. Both students and instructors are required to know and follow these rules and procedures.

VI. Assessment

a) Assessment components

There will be four (4) written **exams** during the course and one (1) **assignment**. The written examinations will test the student's ability to clarify the important biological and biomedical ideas and principles presented in the book. The level will be comparable to the challenging questions that are posed during the interactive introductions. Per exam, the student will get 120 minutes to answer all questions. An answer fulfils adequately in case the pre-formulated criteria are met (using a checklist). Answers should be kept short with a maximum of 100 words per question. These 4 exams will be part of the final assessment. Each exam will count for 20% of the final grade. The oral presentation will also count for 20% of the final grade. At the end of the semester, an overall grade will be determined.

The average grade of the 4 written exams should be **C- or higher**. If not, the maximum of the final grade for this course will be **C-**, or **F** (fail) in case the exam average is below 50%.

b) Main criteria of the assessments

The exam questions can be compared with the questions and exercises at the end of each chapter in the textbook. An answer fulfills adequately in case pre-formulated criteria are met (using a checklist). The grading of the presentation will be done using a template that will be placed on Moodle. It is also important that the PowerPoint® file of the presentation should be uploaded in Moodle. **No grade** (=fail; **F**) will be provided when the file is not uploaded!

VII. Course schedule

Time	Topics to be discussed	Course material used	Assignments and assessment
Week 1 Session 1 26/08/2019	General Introduction Studying Life	Chapter 1	Inventory of prior knowledge
Week 1 Session 2 29/08/2019	Small Molecules and the Chemistry of Life	Chapter 2	
Week 2 Session 1 02/09/2019	Proteins, Carbohydrates, and Lipids	Chapter 3	
Week 2 Session 2 05/09/2019	Nucleic Acids and the Origin of Life	Chapter 4	
Week 3 Session 1 09/09/2019	Cells: The Working Units of Life	Chapter 5	
Week 3 Session 2 12/09/2019	Cell membranes	Chapter 6	
Week 4 Session 1 16/09/2019	---	Chapters 1-2-3-4-5-6	**Test 1 (see Moodle)**
Week 4 Session 2 19/09/2019	Energy, Enzymes and Metabolism	Chapter 8	
Week 5 Session 1 23/09/2019	Pathways that Harvest Chemical Energy	Chapter 9	
Week 5 Session 2 26/09/2019	Photosynthesis	Chapter 10	
Week 6 Session 1 30/09/2019	The Cell Cycle and Cell Division	Chapter 11	
Week 6 Session 2 03/10/2019	Inheritance, Genes, and Chromosomes	Chapter 12	

Time	**Topics to be discussed**	**Course material used**	**Assignments and assessment**
Week 7 Session 1 07/10/2019	DNA and Its Role in Heredity	Chapter 13	
Week 7 Session 2 10/10/2019	---	Chapters 8-9-10-11-12-13	**Test 2** **(see Moodle)**
Week Session 1 14/10/2019	--- BREAK ---		
Week Session 2 17/10/2019	--- BREAK ---		
Week 8 Session 1 21/10/2019	From DNA to Protein: Gene Expression	Chapter 14	Tutorial on literature search for presentation. Hand-out article list.
Week 8 Session 2 24/10/2019	Gene Mutation and Molecular Medicine	Chapter 15	
Week 9 Session 1 28/10/2019	Regulation of Gene Expression	Chapter 16	
Week 9 Session 2 31/10/2019	MODERATION DAY No class **Revision day!**		
Week 10 Session 1 04/11/2019	Genomes and Biotechnology	Chapter 17 and 18	
Week 10 Session 2 07/11/2019	---	Chapters 14-15-16-17-18	**Test 3** **(see Moodle)**
Week 11 Session 1 11/11/2019	Cell Signaling and Communication	Chapter 7	
Week 11 Session 2 14/11/2019	Physiology, Homeostasis, Temperature Regulation; **YESC**	Chapter 39	
Week 12 Session 1 18/11/2019	Animal Hormones	Chapter 40	
Week 12 Session 2 21/11/2019	Neurons and Nervous Systems	Chapter 44	
Week 13 Session 1 25/11/2019	Animal Development	Chapter 43	

Time	Topics to be discussed	Course material used	Assignments and assessment
Week 13 Session 2 28/11/2019	Differential Gene Expression in Development	Chapter 19	
Week 14 Session 1 02/12/2019	The Biology of Cancer	Chapter 11.7	
Week 14 Session 2 05/12/2019	---	Chapters 7-11§7-19-39-40-43-44	**Test 4** **(see Moodle)**
Week 15 Session 1 09/12/2019	Student Presentations, part I	Scientific Articles	
Week 15 Session 2 12/12/2019	Student Presentations, part II	Scientific Articles	

VIII. Student learning outcomes

The aim of this introductory course is to make the student understand the fundamental principles on which life is based. The student should be able to explain these principles from an experimental point of view. It is important that the student learns not only what we know but also how we got to know it.
Learning goals are to understand the topics discussed in the interactive introductions (see list per week below), to reproduce and clarify the discussed topics, to answer questions on the various topics, showing that the student understands the fundamental principles on which life is based, to find relevant scientific research papers in the Medline/Pubmed databases (via the UU library), to read scientific papers and to understand the scientific questions raised, the methods used (if relevant), the results presented in the paper, and to understand the discussions about the subject that places it in a broader perspective, to reproduce knowledge obtained from the scientific literature and to be able to explain to other students the scientific concepts in relation to this knowledge, and finally, to give a clear oral presentation (in pairs), clarifying the scientific question the student has chosen to discuss, summarizing recent knowledge obtained and discussed so far in the scientific literature.

Period	Teaching activities	Student is able to do
Period 1 Weeks 1-3	Classes + self-study Answer chapter questions	Understand the acquired knowledge of molecules and the chemistry of life, cells as the working units of life, and cell membranes. Reproduce and clarify the discussed topics.

Period	Teaching activities	Student is able to do
Period 2 Weeks 4-7	Classes + self-study Answer chapter questions	Understand the acquired knowledge of enzymes, metabolism and chemical energy handling, cell cycles, DNA, genes and chromosomes and heredity. Reproduce and clarify the discussed topics.
Period 3 Weeks 8-10	Classes + self-study Answer chapter questions	Understand the acquired knowledge of gene expression and regulation, genomes and molecular medicine, and cell signaling. Reproduce and clarify the discussed topics.
Period 4 Weeks 11-14	Classes + self-study Answer chapter questions	Understand the acquired knowledge of cellular physiology and communication, animal development, and the biology of cancer. Reproduce and clarify the discussed topics.
Period 5 Weeks 8-15	Finding scientific papers, reading scientific papers, understanding scientific papers, prepare and present an oral presentation	Select and read relevant scientific papers; summarize scientific knowledge by preparing a presentation and present it orally before class; discuss this scientific knowledge

IX. Appendices

General Instructional Objectives (GIO) and Student Learning Outcomes (SLO)

Sadava Chapter 1:
GIO

- Knows the fundamental characteristics of living organisms, that living organisms are the product of / and subject to evolution, and understands that biology is a science.

SLO

1. Can provide a definition of a living organism
2. Familiar with the basic concept of the theory of biological evolution and the tree of life
3. Knows the major events in the evolution of unicellular and multicellular life
4. Can apply the hypothesis-prediction approach to a biological problem.

Sadava Chapter 2:
GIO

- Overview of the characteristics and function of small molecules in living organisms.

SLO
Can explain chemical bonds at the (sub)atomic level

1. Understand why water plays an essential role in (the chemistry of) life
2. Can make calculations for solution concentrations and link acids and bases to the pH scale
3. Can name the most common side groups found in molecules in living organisms and explain what (optical) isomers are.

Sadava Chapter 3:
GIO

- Overview of the characteristics and function of large molecules in living organisms.

SLO

1. Knows the composition of proteins and can distinguish their 4 different structural levels
2. Knows the global structures and biological functions of the different carbohydrate groups and mention the most common ones in living organisms
3. Knows the global structures and biological functions of the different groups of water-insoluble molecules (lipids).

Sadava Chapter 4:
GIO

- Overview of the characteristics and function of nucleic acids and the origin of life

SLO

1. Can define the structures of DNA and RNA and can explain how the chemical properties of these nucleic acids determine their function
2. Can reflect on theories on the appearance of nucleic acids on Earth as the origin of life from different scientific viewpoints.

Sadava Chapter 5:
GIO

- Overview of the structure and function of the organelles that constitute prokaryotic and eukaryotic cells

SLO

1. Can explain, based on biological facts, that the cell is the basic unit of life
2. Knows the structure and biological function of organelles in prokaryotic and eukaryotic cells
3. Has insight in the mechanisms by which the endomembrane system mediates intracellular transport, exocytosis and phagocytosis
4. Can define the most important extracellular structures of plant and animal cells.

Sadava Chapter 6:
GIO

- Insight in cell membrane composition and structure, cell recognition and adhesion, membrane transport processes and dynamics

SLO

1. Has insight in the fluid mosaic model, including the components and can explain the membrane properties as a barrier as well as its function in cell recognition and adhesion.
2. Can explain membrane transport processes, including diffusion, osmosis, active and passive transport.

Sadava Chapter 8:
GIO

- Overview of energy transfer in cells, enzymes and metabolism

SLO

1. Can mention the different aspects of energy conversion
2. Can explain how ATP as an energy molecule plays a central role in cells
3. Can explain why enzymes are biological catalysts

4. Has insight in the working mechanism of enzymes and how these can be regulated.

Sadava Chapter 9:

GIO

- Insight in the main cellular pathways (and their coupling) for harvesting chemical energy for biological processes

SLO

1. The role of redox reactions in energy harvesting, main electron carriers
2. Basic principle of glycolysis, energy investing vs energy harvesting reactions, net yield of ATP, role of enzymes
3. Mechanisms of pyruvate oxidation and the citric acid cycle, role of enzymes and main products,
4. Mechanism of oxidative phosphorylation, role and localization of the components of the mitochondrial electron transfer chain, yield of ATP, energy harvesting under anaerobic conditions (fermentation, mechanism, role of enzymes and yield).

Sadava Chapter 10:

GIO

- Insight in the process of photosynthesis for the binding of energy from sunlight into carbohydrates, so trapping light energy into chemical energy, which is an integral part of plant metabolism

SLO

1. Explain the source of O_2 produced in oxygenic photosynthesis and describe the relationship between the light reactions and the light-independent reactions of photosynthesis
2. The transfer of energy within the reaction center of a light-harvesting complex. Compare and contrast a pigment's absorption spectrum and its action spectrum. Explain how ATP and NADPH are produced in a chloroplast
3. Describe the experiment that led to identification of the steps in the Calvin cycle, and explain how light reactions stimulate the Calvin cycle
4. Explain how and why C_4 plants maintain a high concentration of CO_2 around rubisco and explain how CAM plants carry out carbon fixation separately from Calvin cycle reactions
5. Identify the metabolic intermediates that link photosynthesis to other metabolic pathways and explain the efficiency of energy flow as it moves from the environment through living organisms on Earth

Sadava Chapter 11:

GIO

- Overview of chromosome structure, chromosome replication, the cell cycle and cell division (mitosis vs meiosis)

SLO

1. Function of chromosomes, difference between chromosomes from eukaryotes vs prokaryotes, how DNA is packed in chromosomes from eukaryotes
2. Phases and regulation of the cell cycle, the role of cyclins, cyclin-dependent kinases, Rb1 protein
3. Main components and function of the mitotic apparatus, phases of mitosis, cytokinesis
4. Why meiosis differs from mitosis, its distinct phases, how errors in mitosis and meiosis can generate aneuploidy.

Sadava Chapter 12:

GIO

- Understanding of the mechanism of Mendelian and non-Mendelian heredity, the concept of multifactorial genetics and gene mapping

SLO

1. Derivation of the Mendelian laws from experimental crossings, Punnett square, genetic nomenclature
2. Can apply Mendelian rules of transmission on human pedigrees
3. Can explain the concepts of incomplete dominance, codominance, pleiotropy, epistasis, heterosis and penetrance
4. Can explain the principle of gene mapping and sex-linked transmission.

Sadava Chapter 13:

GIO

- Insight in the structure of DNA and the molecular mechanism of heredity

SLO

1. Has a detailed knowledge on the chemical composition and structure of DNA
2. Knows the main events in DNA replication and can explain how research was done to determine the (molecular) mechanisms of DNA replication
3. Has insight in the mechanism of DNA proofreading occur and can explain the different DNA-repair mechanisms
4. Can describe how DNA can be amplified by the PCR technique and how DNA sequencing is carried out.

Sadava Chapter 14:

GIO

- Insight in the processes of gene transcription and protein synthesis

SLO

1. Knows the 'central dogma' of molecular biology and an example which does not meet this dogma
2. Can describe the different parts of the gene transcription process: transcription initiation, elongation and termination
3. Has insight in the different phases of translation and how these are regulated
4. Can name two kinds of posttranslational events: How proteins are directed to their cellular destinations and posttranslational modifications
5. Can name different types of mutations and understands how these relate to evolution.

Sadava Chapter 15:

GIO

- Insight in the causes and effects of mutations

SLO

1. Knows what mutations are, can describe different mutations and their causes
2. Can describe what kind of mutations lead to genetic diseases, differences between germ line and somatic mutations
3. Can describe techniques for detecting mutations
4. Can describe how genetic screening is used for detecting diseases and susceptibility to diseases
5. Can describe approaches to treat genetic diseases and the principles of gene therapy.

Sadava Chapter 16:

GIO

- Insight in the regulation of gene expression

SLO

1. Can describe the regulation of gene expression in prokaryotes, operator-repressor model, the *lac* operon, mechanism and key-molecules
2. Can describe the regulation of gene expression in Eukaryotes, role of transcription factors and other regulatory proteins
3. Can explain that the expression of transcription factors underlies cell differentiation
4. Can describe how the expression of sets of genes can be coordinately regulated
5. Can describe how viruses regulate their gene expression.

Sadava Chapter 17:

GIO

- Insight in how genomes are sequenced and the information that can be retrieved from this

SLO

1. Knowledge of new methods for rapidly sequencing DNA
2. What did we learn from sequencing Prokaryotic genomes?
3. Knowledge of approaches to 'create' minimal life
4. What did we learn from comparative genome analysis of model organisms?
5. Can describe the main differences between Prokaryotic and Eukaryotic genomes
6. Can describe main characteristics of the human genome and the potential befits of human genomics in medicine
7. Global knowledge of potentialities of proteomics.

Sadava Chapter 18:

GIO

- Principles of recombinant DNA and biotechnology: how to modify cells and organisms for economic and bio-medical applications

SLO

1. Techniques for cutting, splicing and sizing of DNA (fragments), modifying DNA in the test tube, getting it into cells: use of vectors, types of vectors, use of reporter genes for recombinant DNA detection
2. How to 'clone' a gene?, sources of genes, genomic libraries, cDNA libraries, synthetic genes, directed mutation of genes, how to make a knock-out mouse
3. Application of micro-arrays for genome and transcriptome analysis, using antisense RNA and RNAi for studying gene function, identification of interacting proteins with the yeast 2-hybrid technique
4. Applications of recombinant DNA technology: expression of foreign genes in host cells (protein factory) enables production of biomedically useful proteins (examples), increasing production or pest resistance of crops in agriculture, gene-therapy for diseases like cancer etc., applications of PCR technology: DNA fingerprinting, mapping genetic variation, diagnosis of genetic diseases, ethical issues associated with applied genome research.

Sadava Chapter 7:

GIO

- Overview of the main signal transduction pathways in intracellular signaling

SLO

1. Knows the various receptors and can name their location
2. Has insight in the subsequent steps in the various cascades, including protein kinase cascades and the function of the various second messengers
3. Can name the various components (in general) in the signal transduction pathways
4. Is familiar with direct intercellular communication via gap junctions and can explain its role.

Sadava Chapter 39:

GIO

- Insight in the general principles of regulation of physiological systems in maintaining homeostasis

SLO

1. Can explain why regulation of the internal environment is essential in complex multicellular animals and the concepts of feedback and feed forward regulation
2. Global knowledge of the composition of the main types of tissues and the relationships between cells, tissues and organs
3. Can describe how temperature affects living systems and how the temperature sensitivity can be expressed
4. Can describe various ways in animals can alter heat exchange with the environment and the differences between Endotherms and Ectotherms in body temperature regulation
5. Knowledge of the mammalian thermostat and the cause of fever.

Sadava Chapter 40:

GIO

- Give a general introduction in animal hormone action

SLO

1. Can give a definition of hormones and name the different categories of animal hormones
2. Understands and can explain the molecular and cellular basis of hormone production by several endocrine glands
3. Can explain the molecular and cellular basis of hormone action
4. Knows and can explain the concepts underlying regulation of hormone production.

Sadava Chapter 44:

GIO

- Give a general introduction in neurophysiology, including action potentials and structure and function of neuronal and neuromuscular synapsis

SLO

1. Understands and can explain the molecular basis for the membrane potential
2. Can explain the molecular basis of action potentials, including the contribution of ion channel properties
3. Knows and can explain the concepts underlying action potential propagation
4. Has insight in the model for neuromuscular synaptic transmission, including its components
5. Knows the different types of neurotransmitter receptors and can explain the various postsynaptic events.

Sadava Chapter 43:

GIO

- Overview of main stages in animal development

SLO

1. Can describe how fertilization activates development
2. Can describe how mitosis divides up the early embryo and how gastrulation generates multiple tissue layers
3. Can give a global description how body segmentation develops during neurulation
4. Can describe the role of extra-embryonic membranes
5. Can give a global description of the stages of human development.

Sadava Chapter 19:

GIO

- A global insight in the role of differential gene expression in development

SLO

1. Can describe the main processes in development
2. Understands that cell fates become progressively more restricted and can explain how cell fates are determined
3. Can give an example of the role of differential gene expression in development.
4. Can describe how differential gene expression determines pattern formation and the role of morphogen gradients with a examples
5. Can describe the particular role of HOX genes in body segmentation.

Sadava Chapter 11.7 + additional text (Power Point:

GIO

- A global insight in the biology of cancer

SLO

1. Can describe the differences between benign tumors and malignant tumors
2. Can describe the main steps in the development of cancer
3. Can give a global description of the roles of oncogenes and tumor suppressor genes
4. Can describe the role of tumor suppressor genes in cancer susceptibility
5. Has a global insight in the different types of mutations that drive carcinogenesis
6. Has a global understanding of the role of epigenetic mechanisms and the role of the microenvironment in tumor development.

Guidelines for presentation of a scientific article on a biomedical subject

GIO:

Ability to:

- analyze a biomedical topic and to provide a background and context for the biomedical question that is addressed
- gather relevant information from handbooks, scientific literature and other resources
- structure the scientific information in an oral presentation on the scientific topic to others
- the presentation should give evidence of the student's biomedical knowledge and insights as well as his/her critical judgement and opinion.

SLO

- identify a clear hypothesis or central question and make sure all the text relates to this
- use and combine information from different sources
- refer to scientific articles in an appropriate and accurate manner
- make clear that all relevant concepts pertinent to the topic are understood

- present in a brief and clear fashion: come to the point in as few words as possible
- give the presentation a good structure, avoiding mistakes in grammar and spelling, and pictures
- create an attractive and readable lay-out for the PowerPoint presentation.