

مادة علوم الحياة

جدول يبين جميع الأهداف/المحاور/الدروس التي تم تعليق العمل بها للعام الدراسي 2018-2019 وحتى صدور المناهج المطورة استناداً إلى جميع التعاميم السابقة ذات الصلة.

المحاور والدروس المطلوب تعليق العمل بها (للعام الدراسي 2018-2019 وحتى صدور المناهج المطوّرة)

7th Year Basic Education
REDUCTION OF THE LIFE AND EARTH SCIENCES CURRICULUM

Content	- Learning objectives (Skills...)	Remarks
<p>1.1.1- Capture, consumption and choice of food.</p> <ul style="list-style-type: none"> - Capturing or picking up. <ul style="list-style-type: none"> • Organs of capturing and picking up. - Consumption <ul style="list-style-type: none"> • Modes - Digestion. <ul style="list-style-type: none"> • Digestive fluids • Absorption 	<ul style="list-style-type: none"> - Notice that capturing and picking up organs vary to match the different kinds of food. - Distinguish between an animal that picks up food and a predator. <ul style="list-style-type: none"> - Identify capturing and picking up organs of an animal. - Notice that most animals, fragment the solid food before swallowing thus, performing a mechanical transformation necessary to enhance digestion. - Relate consumption organs to types of food. - Notice that some food are consumed directly without transformation. - Identify consumption organs. - Notice that food liquefied by digestive fluids is transformed during digestion into nutrients that can be utilized by the organism. - Understand that absorption is the passage of nutrients into the blood and that the non absorbed materials are eliminated. - Notice that the organs involved in digestion from the digestive system. - Label a schematic drawing of the digestive system of a vertebrate and indicate the pathway of food. 	
<p>1.4.2 From dormant life to active life : hibernation and germination. – Seed germination</p>	<ul style="list-style-type: none"> -Understand that the germination is the passage of a seed from the dormant to the active stage of life. - Determine the principal characteristics of germination. - Determine that the germination requires the following conditions: water, oxygen, and temperature and a seed able to germinate. 	

Content	Learning objectives (Skills...) Ac	Remarks
<p>2- Reproduction</p> <p>2.2 Plant reproduction</p> <p>2.2.1 Reproduction of flowering plants</p> <ul style="list-style-type: none"> - Sexual reproduction <ul style="list-style-type: none"> • Flower • Pollination • Fertilization • Fruit • Seed • Germination • Vegetative reproduction <p>2.2.2 Reproduction of non- flowering plants.</p> <ul style="list-style-type: none"> • Sporangium and spores • Prothallus. • Fertilization • Development: 	<ul style="list-style-type: none"> - Understand that the flower is the reproductive part of a plant. - Label a schematic Diagram and identify the different parts of a flower. - Understand that the stamens is the male reproductive part of a flower and the pistil is the female part. - Label a schematic drawing of a stamen and a pistil. - Identify a pollen grain and an ovule. - Describe the mechanism of pollination until fertilization. - Understand that in some plants the flower can be self pollinated or cross pollinated by the same species. Understand that the pollen grain is the male gamete and the ovule contains the female gamete Understand that the union of the female reproductive gamete and the male reproductive gamete forms the zygote- - Understand that after fertilization the ovaries changes to into a fruit which contains one or more seeds. - Identify the different parts of a fruit - Know that the fertilized ovule becomes a seed - Identify the embryo and food reserve in a seed. - Draw and label the different of a fruit - Know that the embryo develops into plant using food reserves -Identify the different steps of germination - Understand that in some plants, vegetative parts can develop into new plants identical to the parent - Compare vegetative and sexual reproduction - Know that some non-flowering plants reproduce by spores. - Identify a sporangium and spores. - Know that spore forming plants produce a prothallus that gives two types of gametes: the male and the female gametes. - Know that the union of a male and a female gamete gives a zygote. - Know that the development of a zygote gives an adult plant. - Observe a small fern growing from a prothallus. 	<p>- Limited to ferns.</p>

<p>3 - Interdependence of living things 3.2 Relationships between individuals in the ecosystems. 3.2.1 Relationships between individuals of the same species. - Social life. - Importance of communication.</p>	<p>- Recognize that a society is a group of individuals of the same species where each member performs a specific duty. - Identify the principal modes of social lives and specify their characteristics. - Notice that communication in social life is based on the exchange of information among the members of the society and permits the performance of vital functions.</p>	
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REDUCTION OF THE LIFE AND EARTH SCIENCES CURRICULUM

8th Year Basic Education

Content	Learning objectives (Skills...)	Activities	Remarks
<p>3- Earth and the environment</p> <p>3.2 Manifestations of Earth activity</p> <p>3.2.1 Volcanism</p> <p>- Volcanic eruptions</p> <p>-Rocks of volcanic origin</p> <p>- World Distribution</p>	<ul style="list-style-type: none"> - Know that volcanism is a visible manifestation of the Earth's activities characterized by the emission of lava, solid fragments, and gas at its surface. - Notice that the magma is a mixture of melted rocks and gas produced as a result of fusion of solid material situated in the depth of the earth - Relate volcanic eruptions to the arrival of magma to the surface. - Emphasize on the characteristics of smooth volcanic eruptions and explosive ones - Know that the cooled lava from volcanic rocks: Basalt (dense igneous rock) and andesite. - Identify the characteristics of andesite and basalt - Mention that the majority of volcanic rocks have a hemicrystalline structure, containing phenocrysts of microcrysts and quartz - Notice that the structure (hemicrystalline or holocrystalline) of rocks informs about the conditions needed for their cooling. - Indicate the differences existing between the conditions required for the formations of granophyre and andesite. - Localize the two types of active volcanism, that are unequally spread on the surface of the earth, on land as well as in oceans. - Relate the existence of an ancient volcanism in a region to the presence of rocks and volcanic edifices - Notice that seisms result from the brutal rupturing of confined deep rocks where it is known as the focus. 	<ul style="list-style-type: none"> - Analysis of given documents - Analysis of a relief map of the Earth's surface. - Observation and analysis of 	

<p>3.2,2 Seisms - Seisms and seismic waves</p> <p>- World Distribution</p> <p>3.3.1 Structure of the Earth - Earth's surface.</p>	<ul style="list-style-type: none"> - Note that the rupturing of rocks produces seismic waves responsible for the effect that happens on the Earth surface, - Describe the different manifestations observed on the earth surface that results in seism. - Relate the intensity of seism to the effects produced - Relate seisms to converging, diverging, and gliding movements that affect land at the Earth's surface. - Relate the seismogram recordings to the characteristics of seisms. <p>Note that the construction of buildings must respect "paraseismic" methods.</p> <ul style="list-style-type: none"> - Localize the world distribution of the different seismic waves. <ul style="list-style-type: none"> - Know that the ocean floor and land differ in their morphology. - Identify the principal zones of oceans and land. 	<p>documents and graphs.</p> <p>- Analysis and observations of documents, given tables and graphs.</p>	
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REDUCTION OF THE LIFE AND EARTH SCIENCES CURRICULUM
9th Year Basic Education

إنطلاقاً من زيادة عدد حصص المخصصة لمادة علوم الحياة حصة واحدة لتصبح 3 حصص، وانطلاقاً من أن الوقت المخصص لتعليم هذه المادة يستثمر بشكل كبير في التدريب على استخدام الأفعال الإجرائية وليس على محتوى المادة ونظراً لأهمية الدروس والمواضيع المعلق العمل بها من ناحية امتلاك المتعلمين للمهارات والعادات الصحية السليمة ونظراً لسهولة محتواها إلى حد ما، إرتأينا إعادة بعض من هذه المواضيع والتي يشكل محتواها مادة علمية غنية لتدريب التلامذة على منطية التفكير العلمي.

Content	Learning objectives (Skills ...)	Activities	Remarks
1- Nutrition and metabolism 1.2.1 Respiratory system and pulmonary ventilation - Pulmonary ventilation. 1.3.1 Circulatory system - Arterial pressure. 1.3.4 Adaptation of the organism to effort.	Know that pulmonary ventilation is the permanent partial renewal of alveolar air by the rhythmic movement of the thorax. - Notice the permanent presence of oxygen in the pulmonary alveoli. - Calculate the proportion of the renewed air knowing the volume of the residual air. - Know that the arterial pressure is the pressure exerted by the blood on the wall of the arteries. - Notice that the arterial pressure varies during the cardiac revolution between a maximum at ventricular systole and a minimum at the end of diastole. - Notice the importance of the arterial pressure for medical diagnosis. - Notice that there is a modification in the spread of the blood in the organs, at rest and during an intensive activity.	- Give examples from everyday life. - Probing tables of given. - Analysis of sequences of a film. - Use a spirometer to determine the respiratory volume and analyze the obtained results. - Analysis of documents, of tables of givens and of graphs. - Measure the arterial pressure with the help of a sphygmomanometer. - Analysis of documents, of graphs and of tables of givens.	- Mention the consequences of hypotension and of hypertension.

	<ul style="list-style-type: none"> - Notice that the modifications of the respiratory and cardiac rhythms are directly related to the effort done. - There is a correlation between the functioning of circulation and that of respiration in the organism. 		
<p>1.6.1 Varieties and equilibrium of nourishment</p> <ul style="list-style-type: none"> - Role of food. 	<ul style="list-style-type: none"> - Relate the diversity of the organism's needs to the diversity of food. - Know that food ensures, on one hand, the growth of the organism and the renewal of cells by the help of assimilation, and on the other hand, the energy production by respiratory oxidations. - Relate the assimilation to the building food (plastic) and the production of energy to the oxidation of energy food. - Associate to each category of the simple food its energy value. 	<ul style="list-style-type: none"> - Give examples from every day life. - Analysis of documents, of tables of given and of graphs. - Probing a text. 	

<p>2.2 Elaboration of the tactile sensation.</p>	<ul style="list-style-type: none"> - Notice that the tactile sensation is done after a contact with the skin (excitation). - Notice that the elaboration of the tactile sensation necessitates three steps: the excitation of the tactile receptors which provokes a nerve message, the conduction of this message and the role played by the sensory cerebral center. - Draw a functional diagram illustrating the conduction of the tactile nerve message from its initiation until it reaches the nervous center. 	<ul style="list-style-type: none"> - Give examples from every day life. - Analysis of documents and of tables of given. 	
<p>2.2.1 Threshold of stimulation.</p>	<ul style="list-style-type: none"> - Know that the threshold of stimulation is the minimum intensity that a stimulation must attain for eliciting a nerve message. 	<ul style="list-style-type: none"> - Give examples from every day life. - Analysis of documents, of tables of given. 	
<p>2.2.2 Tactile receptors.</p>	<ul style="list-style-type: none"> - Know that the tactile receptors are the structures situated in the dermis and are sensitive to the variations of pressure. - Design and describe an experimental procedure to prove the presence of these tactile receptors. 	<ul style="list-style-type: none"> - Observation of a microscopic section of the skin. 	
<p>2.2.3 Neuron.</p>	<ul style="list-style-type: none"> - Notice that the neuron, characterized by at least two prolongations (nerve fibers), is a nerve cell that creates and conducts the nerve messages. - Identify the characteristics of a nerve cell. - Make a functional diagram of a neuron. 	<ul style="list-style-type: none"> - Dilaceration of a nerve. - Observation of a microscopic preparation of a nerve and of cell bodies in a section of the spinal cord. - Analysis of documents. 	
<p>2.2.4 Synapse.</p>	<ul style="list-style-type: none"> - Notice that the synapse is a region of junction between two neurons ensuring the transmission of nerve messages. - Identify the region of junction between two neurons. 		

Content	Learning objectives (Skills...)	Activities	Remarks
2.3 Organization of the encephalon.	<ul style="list-style-type: none"> - Notice that the human encephalon has three essential parts: the cerebrum, the cerebellum and the medulla oblongata. - Notice that the cerebral hemispheres have different sensory areas that can be localized by the variations of the blood discharge related to the cerebral activity. - Identify the organization of the encephalon of a mammal and notice the activity of a cerebral center. 	<ul style="list-style-type: none"> - Analysis of documents: MRI = Magnetic Resonance Imagery, scintigraphy. 	
2.4 Danger of toxication: addiction to tobacco, alcohol and drugs.	<ul style="list-style-type: none"> - Notice that the function of the nervous system can be disturbed by certain substances (alcohol, tobacco, drugs), by certain elements of the environment (noise, light) and by certain life styles leading to a disequilibrium in the alternation of waking-sleeping. - Know that toxication is a repeated and abused consumption of harmful substances to the organism. - Notice that toxication leads to a dependance revealed by a physical suffering and a psycho-logical one in case of its lack. - Make a relationship between the habituation caused by addiction and the necessity to increase regularly the doses to be consumed to obtain the required effect. 	<ul style="list-style-type: none"> - Give examples from every day life. - Probing a scientific text. - Analysis of documents and tables of given. - Analysis of sequences of a film. - Searching in CDI. 	

Content	Learning objectives (Skills...)	Activities	Remarks
<p>3- Reproduction and genetics.</p> <p>3.3 Sexual reproduction and maintenance of the karyotype of the species</p> <p>- Diversity of gametes</p> <p>3.5 Production of substances necessary for the industry of nutrition and for medicine by genetic engineering.</p> <p>3.5.1 Biomedical and agronutritional use of microorganisms.</p>	<p>- Notice that the random segregation of each pair in the gametes is at the origin of genetic recombination</p> <p>- Relate genetic recombination to the high genetic diversity of gametes</p> <p>- Notice that Man uses certain non-pathogenic microorganisms in biology, in medicine and in the agronutritional industry, for the manufacturing of products that are beneficial to Man.</p> <p>* Notice that biotechnology is the group of industrially used techniques of living beings that aim at producing certain substances necessary for Man.</p> <p>* Notice the means that permit the increase of the yield and the quality of the production.</p>	<p>* Give examples from every day life.</p> <p>* Probing a text.</p> <p>* Analysis of documents, of tables of given and of graphs.</p>	<p>-The origin of mutation/abnormality due to Non disjunction at the level of AI or AII of Meiosis I and Meiosis II respectively is not required.</p> <p>- Only autosomal linked traits are considered in genetics exercises. (exercises related to sex linked traits are suspended)</p>

<p>3.5.2 Variety and importance of the usages of microorganisms.</p>	<ul style="list-style-type: none"> – Notice that the natural use of certain microorganisms permits the production of food, the industrial manufacturing of pharmaceutical substances or of substances used in the production of food. – Show that the biomedical and agronutritional use of microorganisms rests on the use of varieties that can multiply in a certain medium and transforming it. – Search for the diversity of the techniques of the usages of microorganisms. – Demonstrate that certain techniques which modify the genetic make-up of certain bacteria permit the manufacture of nutritional or vaccines... – Schematize a technique of the genetic make-up modification. 	<ul style="list-style-type: none"> – Production of agronutritional and pharmaceutical substances; manufacturing of yoghurt, cheese, bread, antibiotics, vitamins and enzymes. – Analysis of sequences of a film. – Analysis of documents. 	<ul style="list-style-type: none"> – Include some techniques to illustrate the importance of microorganisms.
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Content	Learning objectives (Skills...)	Activities	Remarks
<p>3.5.3 Microorganisms</p> <ul style="list-style-type: none"> * Systematic diversity. 	<ul style="list-style-type: none"> * Know that all microorganisms are only observed under the microscope and that some are pathogenic, others are not. * Notice that the microorganisms belong to many varied groups: protozoa, microscopic fungi, yeasts, mosses, bacteria and viruses. * Gather the criteria that permit to classify micro-organisms. 	<ul style="list-style-type: none"> * Give examples from every day life. * Probing a scientific text. * Analysis of documents and tables of given. 	<ul style="list-style-type: none"> * Do not go through the systematic study of micro-organisms and their characteristics. Mention their presence, their biologic and systematic diversity, and their capability of multiplication in the different techniques used. * Table of classification accessible by students is enough.
<ul style="list-style-type: none"> * Biologic diversity. * Multiplication power. 	<ul style="list-style-type: none"> * Notice that the life styles of microorganisms are widely varied (free life, mutualism, parasitism) and are either aerobic or anaerobic. * Design an experimental procedure that permits to determine the life conditions of some micro-organisms. * Know that the microorganisms quickly reproduce asexually. * Relate the genetic identity of microorganisms to their mode of reproduction. 		

REDUCTION OF THE LIFE SCIENCE CURRICULUM
1st Year Secondary

Content	Learning Objectives (Skills...)	Activities	Remarks
<p>Functional organization of living things.</p> <p>1.1 Nutrition and organization of a chlorophyllic vascular plant</p> <p>1.1.1 Autotrophy and photosynthesis</p> <ul style="list-style-type: none"> - Autotrophy <p>Photosynthetic activity of chlorophyllic cells Leaf and starch synthesis</p>	<ul style="list-style-type: none"> - Understand that chlorophyllic plants are autotrophs They synthesize organic substances from mineral substances present in the medium - Determine the mineral needs of green plants. - Identify the chemical elements that constitute plant living matter. - Demonstrate the presence of starch in green plants - Formulate hypothesis to explain color difference between leaves that are collected in the morning and others collected in the evening. - Find out the necessary conditions for starch synthesis. 	<p>All related documents</p>	<ul style="list-style-type: none"> - Remind students with the scientific content mastered in grade 7 , that chlorophyllic plants are autotrophs. They synthesize organic substances from mineral substances present in the medium

<p>1.2 Communication Communication And Organization In An Animal</p> <p>1.2.1 Nervous communication</p> <ul style="list-style-type: none"> • Nature of the nervous message. <ul style="list-style-type: none"> • Coding and management of the information <p>1.2.2 Hormonal communication.</p> <p>- System of communication.</p> <ul style="list-style-type: none"> • The discovery of chemical communication. 	<ul style="list-style-type: none"> - Understand that the nervous message is a series of recordable electric signals. - Analyze recorded results relative to stimuli below and above the threshold. - Notice that every action potential is a modification of the electric state of the plasma membrane of nerve fiber of constant amplitude and duration. - Elaborate a hypothesis relative to the coding of the nervous message which carries an order of muscle cells. - Relate the significance of the message conducted by a nerve (coding) to the number of activated fiber. - Recognize that the conduction of a nervous message is a biological mechanism related to the properties of the nerve. <ul style="list-style-type: none"> - Understand that nervous centers are structures for the management of the sensory nervous messages. - Point out that nervous centers organize an answer by elaborating a motor nervous message, carrying an order to the effector organ. - Analyze certain experiments that has lead to the discovery of chemical communication. - Explain how the experiment of Bayliss and Starling demonstrates that the communication between the duodenum and the pancreas is done by blood. - Deduce that a hormone is a specific chemical messenger. 	<ul style="list-style-type: none"> - Use of documents or getting information from a text (The work of Pavlov, Wertheimer and Lepage, and Bayliss and Starling). 	
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Content	Learning Objectives (Skills...)	Activities	Remarks
<p>2- Plant productivity and environmental factors.</p> <p>2.1 Producing productive plants.</p> <p>2.1.1 Productive plants and genetic programs.</p> <p>Increased production of productive plants.</p> <p>Production of plants in a massive number.</p> <p>-Vegetative multiplication.</p>	<ul style="list-style-type: none"> - Know that plants are said to be productive when they have the ability of being cultured in an economic and productive way in a given field. - Relate the productivity of a plant to its genetic program. - Find out information that show the improvement done on a plants' productivity. - Notice that Man always resolves to improve the productivity of cultivated plants through empirical selection. - Relate the genetic selection and hybridization to the obtaining of more productive producers. - Plan for an experimental protocol to obtain a pure line. - Identify hybridization techniques and deduce their economic interests. - Appreciate the importance of the conservation of genetic diversity in a species. - Notice that Man has always used the technique of vegetative multiplication (cuttings, grafting,...) to obtain clones. - Explain how in vitro cultures of 	<ul style="list-style-type: none"> - Search in a CDI (Center of documentation and information). - Use of documents. - Search in a CDI. - Observation and analysis of documents (data, tables, films, text...) for the comprehension of hybridization techniques and their economic interest. - Field observation of grafting and cuttings techniques. 	<p>—</p>

<ul style="list-style-type: none"> - Obtaining plants by microfragments. 	<p>meristems, protoplast and by microcuttings, permit obtaining an entire organism identical to the mother plant.</p> <ul style="list-style-type: none"> - Compare the characteristics of different multiplication techniques in vitro. - Understand that a potent cell is capable of giving individuals identical to each other and in turn identical to the mother plant (clones). - Notice the importance of the “non-stop” production of plants. 	<ul style="list-style-type: none"> - Making cultures in vitro in the classroom. - Use of documents, tables and graphs about cultures in vitro concerning ornamental plants (carnation, orchids, roses,...) or food plants (potatoes, peaches, almond, strawberries...) - Getting information from a text 	
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Content	Learning Objectives (Skills...)	Activities	Remarks
<p>3- Management and protection of the environment</p> <p>3.1.3 Management and protection of fresh water habitats - Water protection against pollution.</p> <p>- Reduction of water beds pollution by nitrates.</p> <p>3.2 Degradation, management, and protection of soil.</p> <p>3.2.1 Soils as organized evolving systems. - Organization of a soil.</p>	<p>All objectives related to get rid of nitrates pollutants</p> <p>- Notice that soil is generally organized in a horizon characterized by their structure and texture.</p>	<p>- Observation and analysis of documents. - Use of a scientific text. Analysis of tables and graphs-</p> <p>- Field observation or analysis of documents concerning a soil vertical section.</p>	

<ul style="list-style-type: none"> - Physio-chemical study of soil. • Study of the chemical composition of soil. 	<ul style="list-style-type: none"> - Identify the different soil horizons in a soil profile. - Recognize that the soil components are mineral (sand, silt, clay) and organic in nature (organic debris and humus). - Show the fundamental constituents of soil. 	<ul style="list-style-type: none"> - Experimental study of the main organic and mineral constituents of a soil. 	
<ul style="list-style-type: none"> • Physical study of soil. - Formation of soils. • Factors of formation. • Mechanisms of the formation. 	<ul style="list-style-type: none"> - Relate the texture of soil to its granulometric composition and its structure, to the humic clay complex. - Relate the texture and structure to the porosity, permeability, capacity of water retention and absorption of soil. - Make a relationship between the structure and the fertility of agricultural lands. - Notice that soil is the result of the surface alteration (weathering) of parent sandstone rocks under the combined action of climatic factors (precipitation and temperature) and living things. - Relate the mechanism of soil formation to the degradation of rocks and to the processes of mineralization and humification. - Notice that parent soilstone rock degradation (weathering) is due to physical and chemical processes. - Recognize the role of microorganisms in the transformation of organic matter as a 	<ul style="list-style-type: none"> - Tactile discrimination of soil texture. - Observation of documents or microscopic observation of soil structure. - Measurement of porosity of soils and their capacity of water retention. - Measurement of the calcium concentration in a soil. - Observation of documents. - Analysis of sequences in a film. - Use scientific documents. - Use a key to determine the fauna in a soil. 	<ul style="list-style-type: none"> - Make a link with the second part of the program: plant production and environmental factors. - Limit the study to micro organisms that are responsible

<p>- Evolution of soils.</p>	<p>result of mineralization and humus formation.</p> <ul style="list-style-type: none">- Recognize that soil is a dynamic system that evolves under the action environmental factors.- Differentiate between an evolved soil from a non-evolved soil.	<p>for mineralization and to the detritivores that assure the decomposition of leaves.</p> <ul style="list-style-type: none">- All the steps of evolution of soil starting from rocks to climatic soil (brown soil for example) are not required.
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Content	Learning Objectives (Skills...)	Activities	Remarks
<p>3.2.2 Soils as fragile ecosystems.</p> <ul style="list-style-type: none"> - Soils and vegetal production. • Forests as balanced ecosystems. • Cultivated soils: agrosystems in disequilibrium. 	<ul style="list-style-type: none"> - Precise the composition of the mineral reserves of forest soil. - Relate the uptake of the mineral reserves of soil and the mineralization of litter to the dynamic equilibrium of a forest ecosystem. - Identify the different steps of the cycle of a biogenic element. - Notice that equilibrium of mineral reserves in soil is ensured by natural processes that obtain a supplementary intake of biogenic elements. - Notice that crops take from a medium a major part of organic matter that must be compensated by intakes of mineral elements. - Identify the role of fertilizers in the conservation of the favorable structure of soil (stabilized wet-clay complex) and in restoring the biogenic elements. - Compare between an ecosystem in equilibrium and an agrosystem which is not in equilibrium. 	<ul style="list-style-type: none"> - Observation and analysis of documents. - Use of CDROM to simulate the carbon and nitrogen cycles. - Analysis of graphs and experimental results. - Inquiry to discover the functioning and contribution of agronomic laboratory in Lebanon in making agricultural land fertile. 	

Content	Learning Objectives (Skills...)	Activities	Remarks
<p>3.1 Fresh Water Pollution Degradation of soils by Man's action.</p> <ul style="list-style-type: none"> • Intensive agriculture and erosion. • Deforestation. • Overgrazing. • Chemical and biological degradation of soils. <p>- Protection of soils.</p>	<ul style="list-style-type: none"> - Quality of Water - Know that deforestation, mechanization and intensive cultures, overgrazing and unfavorable climatic factors lead to desertification and soil erosion. - Relate running water and intensive monocultures to erosion. - Identify reasons and consequences of deforestation. - Relate overgrazing to desertification. - Recognize that chemical and biological degradation of soil are due to salinity and the utilization of pesticides. - Relate micro-irrigation and utilization of biodegradable products respectively to the decrease of salinity and the maintenance of microfauna and microflora of soil. - Indicate the principal methods used by Man to protect soil (crop rotation, controlling running water, respecting the forests covers, amending by humus or calcareous substances). - Recognize that Man should have a responsible behavior towards equilibrium in nature. 	<ul style="list-style-type: none"> - Direct observation or analysis of aerial photographs concerning soil degradation and its consequences. - Inquiry on deforestation in Lebanon. - Analysis of documents to show the impact of soil degradation on water tables and productivity..... - Analysis of documents - Analysis of a text. - Research on pesticides used in Lebanon. - Analysis of documents. - Analysis of sequences in a film. 	<ul style="list-style-type: none"> - Underline the importance of ploughing with the direction of inclination in agricultural practices.

REDUCTION OF THE LIFE SCIENCE CURRICULUM
2nd Year Secondary - Humanities

Content	Learning objectives (Skills ...)	Activities	Remarks
<p>1. Reproduction and heredity</p> <p>1.3.2- Medically assisted procreation technique.</p> <p>1.3.3- Birth control and bioethical problems</p> <p>1.4- Sexually transmitted diseases</p>	<ul style="list-style-type: none"> - Point out that the use of medically assisted procreation technique is a procedure capable of alleviating sterility in certain couples. - Recognize that birth control often poses serious ethical, psychological and jurisdictional problems which may not be solved. - Point out that abortion is not a contraceptive method, and that if it is performed within legal limits, it permits termination of a risky pregnancy. - Recognize that sexually transmitted diseases (STD) are infectious diseases transmitted by sexual contact between an infected person and another healthy one. - Notice that sexually transmitted diseases affect males and females. - Recognize that STD are caused by different pathogenic agents. - Identify a few STD. 	<ul style="list-style-type: none"> - Analysis of a table of data relevant to artificial procreation methods. - Observation of documents - Getting information from a text or a document. - Getting information from a text. - Observation of micrographs showing the causative microorganisms of certain STD. - Analysis of a table of data relevant 	<ul style="list-style-type: none"> - Mention the current medically assisted procreation methods: artificial insemination, in vitro fertilization.... - IUD: intrauterine device. - AIDS will be studied under the immunity part.

<p>1.5- Chromosomes</p> <p>1.5.1- Human karyotype</p> <p>1.5.2- Transmission of chromosomes through sexual reproduction</p>	<ul style="list-style-type: none"> - Notice that most STD result in sterility and sometimes death. - Point out that prevention of STD starts with information which permits everybody to assume full responsibility in his sexual relations. - Recall that chromosomes are located in the cell nucleus. - Note that all human beings have the same number of chromosomes. - Point out that a karyotype is the chromosome complement of a somatic cell arranged in pairs by order of size and form. - Identify sex chromosomes and autosomes. - Note that meiosis results in the formation of gametes. - Point out that meiosis reduces the number of chromosomes to the half and consequently every gamete receives one member from every pair of chromosomes. - Demonstrate the role of chromosomes in the determination of sex. 	<p>to STD.</p> <ul style="list-style-type: none"> - Analysis of sequence in a film or projection slides. - Search for information about STD (prevention campaigns, pamphlets...) - Observation of a document showing a human karyotype. - Observation of a male human karotype and a female one. - Analysis of a document - Interpretation of the results of a chromosomal analysis. 	<ul style="list-style-type: none"> - Note that AIDS is the most serious STD disease because no treatment exists actually up till now. - Develop the subject of prevention because the number of STD sufferers is increasing.
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<p>1.5.3- Chromosomes and gene transmission</p>	<ul style="list-style-type: none">- Recognize that the principal constituent of chromosomes is DNA.- Describe the structure of DNA.- Point out that the order of nitrogenous bases in DNA varies infinitely.- Notice that DNA is the hereditary material- Know that the chromosomes carry the hereditary factors (genes).- Point out that a gene is a segment of DNA which determines a certain hereditary characteristic.	<ul style="list-style-type: none">- Getting information from a text or a document about DNA structure.	
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<p>1.6- Genetic and chromosomal abnormalities 1.6.1- Chromosomal aberrations</p>	<ul style="list-style-type: none"> - Recognize that chromosomal aberrations include all the abnormalities of number and structure of chromosomes. - Find out that the aberrations affecting the number of chromosomes arise from accidents occurring during parental meiosis. - Notice that an abnormality in meiosis leads to a bad consequence in the expected baby. - Point out that trisomy-21 (Down's syndrome) is the most frequent chromosomal aberration. - Identify trisomy-21. - Compare the course of normal meiosis to the abnormal one which leads to trisomy-21. - Point out the common characteristics to all persons having trisomy-21. - Notice that trisomy-21 is not hereditary and that its frequency increases with the age of the mother. - Notice that the sex chromosomes may also present abnormality. 	<ul style="list-style-type: none"> - Analysis of documents which reveal the consequence of abnormality during the formation of gametes through meiosis. - Analysis of a table showing the frequency of different chromosomal abnormalities. - Analysis of a relevant document. - Analysis of documents. - Getting information from a text. - Analysis of a graph. - Analysis of karyotypes with abnormalities in the sex chromosomes. - Analysis of a document related to sickle-cell anemia or thalassaemia. - Analysis of pedigrees. 	<ul style="list-style-type: none"> - Do not develop the subject of the aberrations affecting the structure of chromosomes.
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<p>1.6.2- Gene abnormalities</p> <p>1.6.3- Prenatal diagnosis</p> <p>1.7- Human diversity</p> <p>1.7.1- Polymorphism and uniqueness of man</p> <p>1.7.2- Cause of genetic diversity</p> <p>1.7.3- Consequence of genetic polymorphism</p>	<ul style="list-style-type: none"> - Notice that a mutated gene results in a genetic disease. - Notice that genetic diseases are transmitted hereditarily. - Recognize that prenatal diagnosis aims at anticipating the appearance of an abnormality from the embryonic stage of development. - Point out that prenatal diagnosis includes a group of methods for detection of fetal abnormality. - Notice that prenatal diagnosis is carried out when a risky pregnancy is suspected. - Notice that human beings present a very great variability. - Recognize that interchromosomal and intrachromosomal mixing results in unique individuals. - Notice that genetic polymorphism offers advantages to the individual and to the species as well. 	<ul style="list-style-type: none"> - Observation of a document or sequence in a film. - Analysis of photographic documents - Analysis of documents related to heterozygous individuals. - Drawing information out of a text. 	<ul style="list-style-type: none"> - Mutation: modification in the structure of a gene. - Evoke the risks of marriage among relatives. - Pedigree: genealogical tree - Mention the role of mutations. - Mention, as an example, that the DNA is a real “genetic imprint”
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Contents	Learning Objectives (Skills ...)	Activities	Remarks
<p>2- Immunology and Health 2.3- Deficiencies and disorders of the immune system 2.3.1- Allergies</p> <p>2.3.2- Auto-immune diseases</p> <p>2.4- Immune response supports</p> <p>2.4.1- vaccination</p>	<ul style="list-style-type: none"> - Recognize that allergy is an immediate reaction to an allergen. - Identify the two phases of an allergic reaction: sensitization and reaction. - Explain the mechanism of an allergic reaction. - Recognize that auto-immune diseases in certain persons are due attacks made on them by their own immune systems. - Note that it is important to support the immunity system in case of deficiency and failure. - Recognize that there are three ways to support the immunity system: vaccination, serotherapy and bone marrow transplantation. - Recognize that vaccination is a way of prevention which consists of inducing an immune reaction by introduction of an attenuated antigen or a killed one (vaccine) - Notice that vaccination launches an 	<ul style="list-style-type: none"> - Observation of a photographic document showing allergic manifestations in a human. - Analysis of documents relative to allergens and to the reactions which they induce. - Observation and analysis of a document showing the phases of allergy. - Getting information from a text. - Observation of documents on auto-immune diseases or a table of data. 	<ul style="list-style-type: none"> - Mention the existence of a genetic predisposition to allergy. - Mention that allergic reactions may be reduced by antihistaminic medicines. - Mention that there is an obligatory timetable for vaccination in Lebanon.

<p>2.4.2- Serotherapy</p>	<p>unimmediate immune response but with a long-lasting effect.</p> <ul style="list-style-type: none"> - Notice that serotherapy is a curative method which consists of injecting specific antibodies to the antigen in action. - Notice that serotherapy launches an immediate reaction but a short lasting one. 	<ul style="list-style-type: none"> - Observation and analysis of a document showing transplantation. - Getting information from a text. 	<ul style="list-style-type: none"> - Note that the currently used sera of human origin are gradually replacing the sera of animal origin.
<p>2.4.3- Bone marrow transplantation</p>	<ul style="list-style-type: none"> - Recognize that bone marrow transplantation is a recent technique which provides an organism deprived of immunity defenses with cells that can reconstruct these defenses. 		

REDUCTION OF THE LIFE SCIENCE CURRICULUM
2nd Year Secondary –Science Series

Content	Learning objectives (Skills ...)	Activities	Remarks
<p>1- Functional characteristics of the systems of living things at the cellular level.</p> <p>1.1 Biological identity and genetic information.</p> <p>1.1.1 Diversity of organisms: prokaryotes and eukaryotes</p> <ul style="list-style-type: none"> - The biosphere and its living things - Biological identity of organisms 	<ul style="list-style-type: none"> - Know the diversity of the living world and classify the cells of living organisms as prokaryotes and eukaryotes. - Notice the complexity of eukaryotes and criteria of classification. - Deduce the notion of a species. - Identify the polymorphism of a population. - Notice that each individual in a species is original - Know that the building up of an organism and the maintenance of its characteristics constitute its biological identity. - Specify the notion of “identity markers”. - Notice that organogenesis, and growths require nutrients as a source of materials and energy. - Notice that most of the cells of the organism are being constantly renewed while their characteristics are conserved. 	<ul style="list-style-type: none"> - Analyzing documents, tables of givens and graphs related to the: <ul style="list-style-type: none"> • Diversity of living things. • Criteria of international fertilization and the morphologic resemblance between individuals of the same species. • General principles of living things’ classification. - Getting information from: <ul style="list-style-type: none"> • Using results of grafts (between identical twins, between fraternal twins) • tables about blood composition that show the nature of placental exchanges. - Observing sections of the skin during regeneration, and smears of bone marrow, and tissue cultures. 	<ul style="list-style-type: none"> - Do not go through a detailed study about the classification of eukaryotes - Emphasize the placental organization. - Present to the students the characteristics of the animal cell and mention the different techniques of the microscopic observations.

Content	Learning objectives (Skills ...)	Activities	Remarks
<p>1.1.5 Biological identity and the genotype</p> <p>- Phenotype and protein.</p>	<p>-Notice that the cells of an organism contain the same genetic information that ensures the conservation of the biological identity during the development and the renewal of cells.</p> <p>- Know that the phenotype is a group of visible characters of an individual.</p> <p>- Note that the majority of the phenotypic characters are hereditary and are often determined by the genetic program</p> <p>- Relate the phenotype of an individual to the expression of its genes (structural and enzymatic proteins).</p> <p>- Notice that the diversity of phenotypic characters is due to the various proteins that are at the origin of these characters</p>	<p>-Observing microscopic preparations and using documents that show mitotic division.</p> <p>-Observing electronographic duplication of chromosomes.</p> <p>-Getting information from a text or analyzing tables of documents or of graphs (sickle cell anemia, blood types, hypercholesterolema, albenism, phenylketoneuria...).</p>	

Content	Learning objectives (Skills ...)	Activities	Remarks
<p>1.2 Molecular renewal and energetic metabolism</p> <p>1.2.1 : Molecular renewal.</p> <p>- Continuous renewal of molecules of the organism.</p>	<ul style="list-style-type: none"> - Know that the molecules that constitute the cell are constantly renewed, whether these cells have or don't have the potential of dividing. - Describe the "Labeling" technique of the molecules by radioactive isotopes to determine their "duration of life". - Differentiate between the speed of renewal and the proportion of renewal or "half-life" of a molecule. - Specify the structure of the plasma membrane. - Note that the characteristics of this membrane are maintained despite of the molecular renewal. - Infer that the living beings present constancy in their structures at all levels of the organism, due to a dynamic equilibrium between the degradation of molecules and the synthesis of these same molecules. 	<ul style="list-style-type: none"> -Using experiments concerning the use of labeled molecules to give an evidence of molecular renewal. -Analyzing documents and graphics related to the speed and amounts of molecular renewal. _Observing the electronography of plasma membrane. -Analyzing documents, tables of givens and graphs. 	

<p>- Origin of the molecules necessary for renewal.</p>	<p>- Recognize that the nutrients are the necessary molecules for renewal. - Relate nourishment to cell renewal. - Specify that the amino acids are “builders” that the organism uses to construct its own material.</p> <p>- Differentiate between the necessary molecules and the indispensable ones. - Note that the indispensable molecules (amino acids, fatty acids...) are of a nutritive origin. - Notice that the necessary molecules but not indispensable, can have an endogenic origin.</p>	<p>-Analyzing documents, tables of givens related to the:</p> <ul style="list-style-type: none"> • Comparison between the nutritive qualities of certain foods. • Comparison between the nutrition of the infant and that of the adult. • Giving an evidence of the indispensable amino acids and fatty acids. • Giving an evidence of the indispensable molecules that are not the same in different species. 	
<p>- Condition of the molecular renewal.</p>	<p>-Recognize that the specific enzymes condition the reactions of molecular renewal. -Relate the molecular renewal to catabolism. -Relate the functional organization of the cell to the molecular renewal.</p>	<p>– Getting information from document, tables of givens and graphs.</p>	<p>-Emphasize the fact that certain molecules that are used in the renewal originate from recycling and not from food uptake.</p> <p>-Emphasize the essential role of enzymes in the metabolic reactions (catabolic and anabolic).</p>

Content	Learning objectives (Skills ...)	Activities	Remarks
<p>2- Interdependence of living things and their relationship with the environment.</p> <p>2.1 conversion of light energy into chemical energy.</p> <p>2.1.1 Solar rays: source of initial energy.</p> <p>-Effect of the luminous radiation on photosynthesis.</p> <p>- Luminous radiation and chlorophyll</p>	<p>-Recognize that the chlorophyllic plants ensure the conversion of a part of the energy of the solar radiation into chemical energy.</p> <p>-Notice that the energy fixed, by the chlorophyllic plants, will be used by all living things of an ecosystem.</p> <p>-Notice that the solar light is a set of electromagnetic radiation of wavelength varying between 400 and 700 Mm.</p> <p>-Notice that the electromagnetic radiations of light do not have the same efficiency on the photosynthetic activity.</p> <p>-Identify the different pigments of crude chlorophyll.</p> <p>-Give an evidence of the absorption of certain luminous radiations by crude chlorophyll solution.</p> <p>-Compare the absorption of the spectrum by crude chlorophyll to that of the photosynthetic spectrum action of green plants.</p> <p>-Note that the luminous radiations absorbed by chlorophyll are the most effective for photosynthesis.</p>	<p>-Analyzing the spectrum of white light.</p> <p>-Analyzing the experimental results showing the velocity of oxygen liberation during photosynthesis.</p> <p>Interpret the action of the spectrum on a green algae.</p> <p>-Extracting crude chlorophyll.</p> <p>-Separating the different pigments of crude chlorophyll, by paper chromatography.</p> <p>-Analyzing the experimental results of the absorption of spectrum by chlorophyll.</p> <p>-Comparing between absorption of spectrum by chlorophyll to that of a green algae.</p>	

<p>2.1.2 Conversion of the light energy into chemical energy in chlorophyllic organisms.</p> <p>- Chloroplast: the organelle of photosynthesis.</p> <p>- Functional organization of a chloroplast.</p>	<p>-Know that the chloroplast is the center of a group of photosynthetic reactions.</p> <p>-Compare the organization of a chloroplast to that of a mitochondrion.</p> <p>-Draw a diagram representing the observation of the ultrastructure of a chloroplast and label it.</p> <p>-Notice that isolated chloroplasts liberate oxygen in the presence of light and an oxidizer.</p> <p>-Notice that the photochemical phase of the photosynthetic activity (light reaction) takes place in the membrane of thylakoids and that the chemical phase (dark reaction) takes place in the stroma of the chloroplast.</p> <p>-Notice that the absorption of photons by the chlorophyll pigments, excites the chlorophyll molecule provoking the energized electrons to leave the molecule.</p> <p>-Know that the vacancy in electrons of the energized chlorophyll molecules are replaced by electrons produced by photolysis.</p> <p>-Note that the proton flux permits the formation of ATP by the help of the enzyme ATP synthetase.</p> <p>-Know that the protons and the electrons are finally taken in charge by a carrier found in the stroma that is then reduced by hydrogen.</p> <p>-Notice that the photolysis of water is an oxidation reduction reaction.</p>	<p>-Analyzing documents related to the ultrastructure of a chloroplast and a mitochondrion.</p> <p>-Analyzing the experiment of Hill.</p> <p>-Analyzing graphs showing the incorporation of the carbon dioxide in light and in darkness.</p> <p>-Interpreting experiments by using labelled water.</p> <p>-Getting information from documents or tables of givens.</p>	<p>-Insist on the similarities in the organization of the two organelles.</p> <p>-Prerequisite: a previous study of oxidation reduction in chemistry.</p>
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<p>- Stroma: the center of the elaboration of chemical energy</p>	<p>-Give an evidence of the incorporation of carbon dioxide in the formation of organic molecules during photosynthesis. -Realize that during the chemical phase, ATP and the reduced carrier (NADPH) allow the reduction of carbon dioxide in order to form organic substances by the help of carboxylase enzyme. -Notice that there is a coupling relation between the two phases: the chemical and the photochemical. -Relate the varied biosynthetic activities (carbohydrates, lipids, and proteins) to the intervention of the enzymes found in the stroma.</p>	<p>-Analyzing an experimental protocol and interpreting the results of Calvin's and Benson's experiment. -Reading the chromatogram.</p> <p>-Getting information from documents or from a text.</p>	<p>-Prerequisite: a previous study of oxidation reduction in chemistry.</p>
<p>2.2 Energy flow and the carbon cycle in ecosystems.</p>	<p>- Know that the trophical relationships between all the living things of an ecosystem, ensure a transfer of materials which favors a flow of energy.</p>	<p>- Getting information from a text.</p>	
<p>2.2.1 Trophical organization of an ecosystem.</p>	<p>- Differentiate between primary productivity and secondary one, producers and consumers. - Notice that there is a progressive decrease of biomass starting from producers until the final consumer, in an ecosystem of dynamic equilibrium. - Illustrate the complexity of the trophical relationships in an ecosystem by ecological pyramids. - Compare the pyramid of biomass to pyramids of productivity.</p>	<p>- Probing through documents, graphs, and givens about the net and the crude photosynthetic turnover and on the ecological turnover. - Interpreting tables of givens related to the ecological pyramids.</p>	

<p>2.2.2 Energy flow in an ecosystem.</p>	<ul style="list-style-type: none"> - Notice that every energetic conservation (photosynthesis, biological oxidation...) liberates heat. - Know that the primary production, conditions the flow of energy in an ecosystem. - Notice that the quantitative study of the energy flow in an ecosystem allows the establishment of energy relationships at equilibrium. - Establish a relationship between the heat lost and energy conservation in an ecosystem, which explains the release of external energy. 	<ul style="list-style-type: none"> - Getting information from documents, graphs, and tables of givens. - Analyzing a concept map of energy in an ecosystem. 	<ul style="list-style-type: none"> - Guide the students to reflect upon the use of natural resources by Man.
<p>2.2.3 The carbon cycle in an ecosystem</p>	<ul style="list-style-type: none"> - Recognize that the energy flow maintains the cycles of materials and in particular the carbon cycle in an ecosystem in equilibrium. -Notice that autotrophs change the mineral carbon they have in the oxidized form as carbon dioxide into organic carbon. -Notice that carbon is restored to the environment, principally, in the form of carbon dioxide by the catabolism of living things. - Identify the essential role of the microorganism decomposers in the mineralization of carbon. -Relate the phase of mineral carbon reduction during photosynthesis to the mineralization phase of organic carbon during metabolic processes. -Draw the carbon cycle in an ecosystem. -Recognize that the recycling of the organic carbon into mineral carbon in an ecosystem is done by energy loss in the form of non-retainable heat. -Notice that the solar energy is the “motor” of the carbon cycle. 	<ul style="list-style-type: none"> -Getting information from documents and tables of given relative to the passage of “mineral” carbon to “organic” carbon and vice-versa. -Probing through documents and givens on the importance of the metabolism of microorganisms found in the soil. -Analyzing documents. -Getting information from a text. 	

<p>2.3 Man and the carbon cycle. 2.3.1 Biogeochemical Cycle of Carbon.</p>	<p>-Identify the principal reservoirs of carbon. - Notice that the exchange of carbon between the atmosphere and the living organisms is done by biochemical processes (photosynthesis, respiration, fermentation) - Notice that the exchange of carbon between the atmosphere and the oceans is done by physico-chemical processes.</p>	<p>-Getting information from a text or documents on the “mobilized” carbon dioxide (atmosphere, oceans, and continental biospheres) and on the “immobilized” carbon reservoirs. -Probing through documents and analyzing graphs on the flow of carbon between the different reservoirs to end with a biogeochemical cycle of carbon. -Getting information from documents, givens and graphs.</p>	<p>-Note that the total reserve of carbon in our planet is 37042203 gigatons; 1Gt = 10⁹ tons.</p>
<p>2.3.2 Human activities and the Carbon Cycle</p>	<p>-Draw the biogeochemical cycle of carbon. Recognize that the biogeochemical cycle of carbon conveys a dynamic equilibrium. -Notice that the biogeochemical cycles may be distributed by different factors, particularly by human activities. -Mention that the human activities lead to an important mobilization of stocks of “trapped carbon”. Relate the rapid increase of the level of carbon dioxide in the atmosphere to human activities. - Notice that the carbon dioxide has a greenhouse effect and that the natural variation of its concentration has an important climatic consequence. Note that the intensified greenhouse effect leads to the reheating of the atmosphere of which the present knowledge hardly allows to evaluate its importance.</p>	<p>-Analyzing graphs and probing through documents on the variation of the carbon dioxide level in the atmosphere. -Interpreting graphs and tables of givens on the increase in carbon dioxide concentration, in function of time and on the future evolution of the climate.</p>	<p>-Emphasize on the human responsibilities in the management of our planet, while insisting on the complexity of problems on the planetarium scale and on the uncertainty of the expectations.</p>

The entire unit concerning Human Reproduction is suspended.

<ul style="list-style-type: none"> • Need of amino acids 	<p>certain amino acids which must be found in food.</p>	<ul style="list-style-type: none"> - Probing experimental results: Experiments conducted on animals (Magendie, Osborne, and Mendel) - Probing the doc related to the nutritional or biological value of a protein and the information accompanying it. 	<p>avitaminosis disease.</p> <ul style="list-style-type: none"> - Needs of non-essential amino acids to build up body proteins (structural and functional proteins). Some aminoacids are produced in the body (nonessential aminoacids) while other aminoacids are not and should be supplied by protein rich food. (analysis of table showing the source of some of the non essential amino acids and their quantitative needs. The information is not for memorizing)
<ul style="list-style-type: none"> • Needs of fatty acids 	<p>Recognise that certain fatty acids are not synthesized by the body and that they must be supplied by food (particularly vegetable oil).</p>	<ul style="list-style-type: none"> - Drawing information from a text or analysis of experimental results (experiment of Evans and Burr in 1928) - Observation and analysis of documents or graphs. 	<ul style="list-style-type: none"> - Stress only the fact that certain fatty acids are not synthesized by the body and that they must be supplied by food (particularly vegetable oil).
<ul style="list-style-type: none"> • Needs of Minerals <p>1.4 Biological Renwal</p>	<ul style="list-style-type: none"> - Needs of mineral slats: Recognise that certain mineral elements such as iodine and fluorine are essential in a very small dose for the proper functioning of the organism, and that their total lack induces very serious troubles. - Recognise that the stability of living is not as it appears - Point out that the majority of 	<ul style="list-style-type: none"> - Drawing information from text or document - Observation of documents, skin section, blood smears,.. and evidences from daily life 	<ul style="list-style-type: none"> - Stress only the fact that certain mineral elements such as iodine and fluorine are essential in a very small dose for the proper functioning of the organism, and that their total lack induces very serious troubles. The sources and role of the different ions is not for memorizing.

- Food Digestion and dissimilation
- Synthesis of molecules

cells in a body are continuously replaced and that their characteristics are maintained in spite of renewal.

Know that the constituting molecules of all cells are renewed without stop

- Recognise that continuous renewal of molecules compensates for loss occurring due to continuous degradation of intracellular materials in a manner which lets the organism maintain a dynamic equilibrium.
- Note that biological renewal might not happen except when the diet is balanced.
- Know that the molecules necessary for biological renewal are derived from nutrients produced by food digestion.
- Understand that nutrients are assimilated by the cells in order to construct their proper matter and insure biological renewal.
- Know that proteins are macromolecules synthesised according to a plan which imposes its sequence of amino acids on their manufacture.

Content	Learning objectives (skills...)	Activities	Remarks
<p>2. Neurobiology, human behavior and health.</p> <p>2.1 Social communication.</p> <p>- Aggressiveness.</p> <p>- Dominance.</p> <p>- Emotional and stress reactions.</p>	<p>The student should be able to:</p> <ul style="list-style-type: none"> - Recognize that social life involves inter-individual relations of diverse nature, and based on communication that may be expressed as aggressiveness, dominance and emotional reactions. - Understand that aggressiveness is a natural tendency to attack, which exists in the majority of species. - Take into account that aggressive behavior is linked to reality, innate disposition, and may result from frustration induced by an obstacle. - Point out that dominance is an individual tendency to control others behavior and establish and maintain a social structure based on a hierarchy. - Recognize that an individual is permanently subject to disturbances of various origins called stress, which constitute aggression towards his own organism. - Point out that too many situations may 	<p>-Analysis of documents.</p> <ul style="list-style-type: none"> - Observation of documents - Drawing information from text - Analysis of sequence in a film 	<p>-Draw attention to the fact that communication is achieved by exchange of signals (speaking, sings...) received by sensory receptors.</p> <p>-Mention that certain aggressions due to stress are greatly perceived (death, divorce...) and they provoke marked emotional reactions while others, such as the daily stress (traffic...) are not</p>

<p>underlie stress.</p> <ul style="list-style-type: none"> - Notice that the organism reacts to stress by visible, immediate, involuntary and adapted responses. - Take into account that the organism's reaction towards stress is defense reactions which favor fight or flight. - Recognize that certain reactions towards stress concern the functioning of internal organs while others affect behavior. - Notice the existence of discreet responses in many situations of stress such as hormonal fluctuation. - Note that an organism reacts sometimes in an unfavorable manner when it is under intense stress. - Point out that regulatory and adapting reactions to stress involve intervention of sensory receptors, integrating nervous centers and effectors. - Notice that the nervous system and the hormonal one function together to face stress. - Point out that the hypothalamus plays an integrating role for the nervous and hormonal mechanisms. - A behavioral act, in response to aggression, involves both the nervous and 	<ul style="list-style-type: none"> - Getting information from text - Analysis of graphs. - Evidence from every day life. - Analysis of a diagram showing the nervous mechanism acting during reaction to stress (cold...) - Analysis of diagrammatic figure showing the different nervous and hormonal pathways. - Drawing information from a text or a table. 	<p>perceptible except when they are added.</p> <p>- Recall briefly in the form of a general diagram the possible sense of nervous messages between receptors, nervous centers and effectors.</p>
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endocrine system.

- The elements which interfere in regulating and adapting reactions to stress which are sensory receptors (eyes, ears, skin sensory receptors, as well as the receptors for blood pressure), nervous centers in the brain and mainly in the limbic system (without going into details about the limbic system) and effector organs (facial muscles, blood vessels, glands, etc..)
- The emotional response to transient stress like danger (fight or flight reaction) which is regulated by adrenaline secreted by the adrenal medulla gland. The latter is stimulated by nervous system (centers in the limbic system are involved).
- Adrenaline favors the increase of the frequency of cardiac activity, the respiratory activity, and the increase of glucose concentration in blood and redistributes blood to muscles. All these consequences tend to provide muscles with sufficient glucose and oxygen gas so that muscle tissues undergo cellular oxidation to produce sufficient energy needed for flight reaction.
- The emotional response to long term stress (suffering from chronic disease) which is

regulated by Glucocorticoid hormones secreted by the adrenal cortex. The latter is stimulated by nerve centers in the limbic system. Glucocorticoid favors the increase in blood glucose level and lowers the excretion of water from the kidneys and has an anti-inflammatory effect that helps the organism in resisting aggression. If long term stress persists for long duration it results in decreasing the concentration of released glucocorticoids (exhaustion phase) which result in weak immunity and other health problems that might lead to death.

Content	Learning objectives (skills...)	Activities	Remarks
<p>2.2 Nervous communication</p> <ul style="list-style-type: none"> - Nervous message - Synaptic transmission - Cerebral activity and conditioned reflex. 	<ul style="list-style-type: none"> - Note that the nervous impulse is a temporary electric signal which corresponds to inversion of polarisation of the neuron membrane. - Relate depolarisation which constitutes the action potential to alteration of neuron membrane permeability to Na and K ions. - Excitatory post synaptic potential (hypopolarization of post synaptic membrane) and Inhibitory synapse (hypeplarization of post synaptic membrane) - Point out that the human's brain consists of two cerebral hemispheres composed of white matter covered by a grey one which forms the cerebral cortex. - Note that the cerebral cortex contains an enormous quantity of neurons. - Recognise that the human cerebrum is a treatment center for complex nervous messages. - Understand that the cerebrum is the organ of the central nervous system at the origin of general sensitivity and general movement. - Point out that the cerebral cortex is 	<ul style="list-style-type: none"> - Analysis of documents. - Observation of documents - Drawing information from text - Analysis of sequence in a film - Getting information from text 	<ul style="list-style-type: none"> - Draw attention to the fact that communication is achieved by exchange of signals (speaking, signs...) received by sensory receptors. - Stress the fact that excitatory synapse allows the passage of nerve message while inhibitory synapses don't. - Point out the existence of excitatory synapses which permit passage of the nervous message, and opposing inhibitory ones on the same neuron.

<p>• The cerebrum and conscious perception</p>	<p>divided into sensory areas, motor areas and associative ones.</p> <ul style="list-style-type: none"> – Note that the area of general sensitivity receives nervous messages sent by different receptors in the body, and that the psycho-sensitive areas integrate and interpret sensations to elaborate perception. – Specify the afferent sensory pathways and their synaptic relays. – Recognise that all voluntary actions are commanded by the motor area of the cerebral cortex. – Locate the motor area in the cerebral cortex. – Note that every part of the body is represented in the motor area as a function of its functional importance. – Specify the direct voluntary motor pathways and indirect ones (pyramidal and extra-pyramidal). – Indicate that the nervous motor pathways intersect and that every motor area commands the opposite half of the body. – Recognise that the psychomotor area allows co-ordination of voluntary movements. – Point out that voluntary movements are controlled by different levels of the central nervous system and that 	<ul style="list-style-type: none"> – Analysis of graphs – Evidence from every day life. – Analysis of a diagram showing the nervous mechanism acting during reaction to stress (cold...) – Analysis of diagrammatic figure showing the different nervous and hormonal pathways. – Drawing information from a text or a table. – Observation of a model or a frontal section of the cerebrum. – Microscopic observation of a section of the cortex. 	<ul style="list-style-type: none"> – Mention that certain aggressions due to stress are greatly perceived (death, divorce...) and they provoke marked emotional reactions while others, such as the daily stress (traffic...) are not perceptible except when they are added. – Recall briefly in the form of a general diagram the possible sense of nervous messages between receptors, nervous centers and effectors.
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<p>2.3 Hormonal communication.</p> <p>- Characteristics of the hormonal message</p> <ul style="list-style-type: none"> • Elaboration and transportation of hormonal messages. <p>- Neuro-hormonal integration.</p> <ul style="list-style-type: none"> • Complementary of the nervous and hormonal systems. 	<ul style="list-style-type: none"> - Recognise that inside an organism, different groups of cells communicate among one another by hormonal messages. - Understand that a hormone is a chemical compound produced by an endocrine gland and then liberated in small amount into the internal medium acting as a means of transport. - Note that endocrine glands manufacture and secrete hormones under the effect of nervous, hormonal or mixed stimulations. - Point out that production of hormones is carried out in steps: taking raw materials from the blood, synthesis and later secretion. - Note that hormones act on target cells and modify their activity. - Point out that responding of target cells to hormonal messages requires temporary binding between the hormone molecules and receptors located on the membrane or inside the target cell. - Recognise that certain activities the body involve some complementarity 	<ul style="list-style-type: none"> - Analysis of a document showing the multiple nervous mechanisms intervening in a voluntary movement - Recall in the form of a diagram the anatomical elements of the pathway of the Nervous message during a simple reflex. - Analysis of a text about pavlov's experiment - Drawing information from text - Drawing information from text - Drawing information from text - Analysis of documents 	<ul style="list-style-type: none"> - Draw attention to the fact that paralysis of the right half of the body may be induced by destruction of the left motor area. - Mention that spinal reflexes or bulbar ones are
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<ul style="list-style-type: none"> • Role of the hypothalamus. <p>2.5 Biological rhythms.</p> <p>- Synchronisation of endogenic rhythms.</p> <p>- Applications of chronobiology</p>	<p>between nervous and hormonal mechanisms.</p> <ul style="list-style-type: none"> - Take into account the integrating role of the hypothalamus in neuro-hormonal correlation. - Recognise that biological rhythms are periodic variation of the functions of the body. - Point out the existence of biological rhythms at all levels of the organism. - Note that the well known biological rhythms are the circadian ones or those with medium frequency. - Notice that sleep is a phenomenon that passes in many phases. - Notice that the awakening-sleep rhythm changes and progressively through out life. - Note that the troubles of sleep are very frequent , and that anxiety is often the cause, and that proper hygiene may prevent those troubles. - Point out that biological rhythms have an endogenous origin but they are synchronised by environmental factors. - Point out that in the human kind, the principal synchronisation is the 	<ul style="list-style-type: none"> -Analysis of documents - Observation of a microscopic section of an endocrine gland - Analysis of documents - Analysis of documents - Analysis of documents and graphs 	<p>innate</p>
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	<p>rhythm imposed by the social context: the schedule of activity and rest.</p> <ul style="list-style-type: none"> - Notice that the body presents a periodic variation in its susceptibility to administered chemical substances. - Deduce that the conditions of life and work may disturb the biological rhythms. 	<ul style="list-style-type: none"> - Analysis of documents - Probing documents which show the relation between the hypothalamus, hypophysis, glands and target cells. - Analysis of a table of data - Analysis of documents - Analysis of a hypnogram - Analysis of sequence in a film - Analysis of documents - Drawing information from text - Getting information from text which provides experimental results. 	<ul style="list-style-type: none"> - Limited to only one endocrine gland (the thyroid pancreas...) - Draw attention to the existence of circannual rhythms... - The mechanism of sleep is not required.
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		<ul style="list-style-type: none">-Getting information from text - Analysis of graphs which represent the interference between the biological rhythm and the time of administration of medicines.- Drawing information from a text or a document.	<ul style="list-style-type: none">- Chronobiology: study of biological rhythms. - Pharmacology: science of drugs, i.e. natural or synthetic chemical substances capable of inducing a biological response.- Give as an example the work by shifts. - Chronopharmacology: study of the effects of medicines according to the time of their administration.
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REDUCTION OF THE LIFE SCIENCE CURRICULUM
3rd Year Secondary - Life Science Series

Content	Learning objectives (Skills...)	Activities	Remarks
<p>1- Genetics 1.3 Genetic diversity of populations.</p> <p>1.2 Fundamental mechanisms of sexual reproduction and genetic recombination 1.2.2 Fertilization</p>	<ul style="list-style-type: none"> - Know that a population is a group of individuals of the same species who live and reproduce by interbreeding in a well-defined medium. - Notice that this group of individuals share a "gene pool" proper to the population. - Notice that in any population there is a genetic variation known as polymorphism. - Establish a relationship between the selective pressure exerted by the environmental factors and the increase in the frequency of certain alleles in defined populations. - Point that the migration tends to decrease the genetic divergences between the populations of a species. - Notice that natural selection stresses the genetic divergence in the case where the populations are placed in different environmental conditions. - Infer that there are no specific alleles that define a certain human population. - Notice that human populations differ in the relative frequency of alleles of certain genes. - Deduce that the notion of race is perfectly arbitrary and without scientific foundation. - Draw the different steps of fertilization 	<ul style="list-style-type: none"> - Analysis of documents, of tables of given and graphs. - Probing a text. - Searching in CDI. - Analysis of documents, tables of given and graphs. - Searching in CDI. - Probing a text. 	<p>There is prerequisite knowledge that fertilization restores the diploid state of the organism (must be stressed)</p>

Content	Learning objectives (Skills...)	Activities	Remarks
<p>2- Immunology 2-4: Deficiency of the Immune system</p> <ul style="list-style-type: none"> • Allergy <p>3.3 Example of cerebral activity: directed motor activity</p>	<p>All objectives related to Allergic reaction are suspended</p> <p>All objectives related to this content are suspended</p> <ul style="list-style-type: none"> - Discover that the encephalon is a privileged and protected structure which treats information. - Notice that the brain is made up of a large number of neurons forming numerous interconnections. - Define the directed motor activity as an intentional movement (voluntary). - Locate the neuron of the parietal cortex participating in the directed motor activity. - Determine the motor areas and the motor nervous pathways. - Relate between making an intentional movement and the permanent integration of the sensory information to the motor orders in the neurons of the nervous centers. - Notice that the triggering of the motor activity is done by the under-cortical and cerebellar centers that participate in a very important way in the regulation of the directed motor activities. 	<ul style="list-style-type: none"> - Analysis of documents and of tables of given concerning the: <ul style="list-style-type: none"> • organization of the encephalon. • histological sections of the cerebral cortex. • different methods of exploring the cerebral cortex (Scanner, MRI, EEG, Scintigraphy...) - Analysis of electrophysiological recordings of the activity of neurons of the cerebral cortex. 	<ul style="list-style-type: none"> - MRI (magnetic resonance imaging). - EEG: (electroencephalography).

4- Systems of regulation and functional unity of the organism.

4.1 Regulation of glycemia.

4.1.1 Glycemia, a dynamic equilibrium.

- Notice that glycemia slightly fluctuates around an average value called glycemie constant.
- Notice that glycemia is a state of dynamic equilibrium and that it is a parameter to be adjusted.
- Discover the mechanism of glycogenogenesis in the liver.
- Notice that the muscles store glucose in the form of glycogen and that the adipose tissues directly transform the glucose into lipids.
- Compare the functioning conditions of the following organs: liver, muscles, and adipose tissues...
- Know the mechanism of glycogenogenesis and of neo-glycogenesis.
- Notice that only the liver is a glucose liberating organ, because the hepatic cells contain the enzyme glucose – 6n phosphatase.

4.1.2 Regulating system of glycemia.

- Hypoglycemic system.

- Determine the predominant role of the pancreas (central organ of the regulating system) in the mechanism that controls the storing and he liberation of glucose.
- Identify the histological structure of the pancreas and locate on this structure, the α and β cells of the islets of Langerhans.
- Notice that the β cells elaborate and secrete insulin.
- Know that insulin is a polypeptide formed from 51 amino acids distributed into two chains A and B united by sulfur bridges.

- Analysis of experimental results relative to:

- Dosage of glycemia in different situations (a person in a state of provoked hyperglycemia).
- Ablation of the liver in a animal.

- Experiments of Claude Bernard.
- Techniques of dosage of glycemia.

(Fehling and reactive strips).

- Analysis of experimental results of ablation, of grafting and of injection.
- Detecting the diabetes mellitus.
- Observation of a microscopic section of the pancreas.
- Identification of the α and β cells by immunomarking.
- Analysis of experimental results showing the influence of the

<p>- Hyperglycemic system.</p>	<ul style="list-style-type: none"> - Prove the hypoglycemic role of insulin. - Notice that the target cells of insulin have insulin-dependent specific membrane receptor. 	<p>glucose concentration on the secretion of insulin.</p> <ul style="list-style-type: none"> - Analysis of experimental results (glucogenesis, lipogenesis). - Analysis of given relative to the possible cause of diabetes. 	<ul style="list-style-type: none"> - Hyperglycemic hormones : adrenaline, cortisole, growth hormone (GH).
<p>4.1.3 Autoregulation by negative retroaction</p>	<ul style="list-style-type: none"> - Know that glucagon is a hyperglycemic polypeptide hormone formed of 29 amino acids and elaborated by α cells of the pancreas. - Notice that there are other hyperglycemic hormones in the organism. - Know that any system of regulation has a system to be regulated (here the maintenance of glycemia at a visible value of 1g/liter) and a regulating system. - Notice that any regulating system implies at least: receptors, a system of transmission of information and effector organs. - Draw a functional diagram of the organization of a regulating system. - Notice that glucose by the value of glycemia plays the role of “informative molecule”. - Notice that in the hypothalamus there are glucose-sensitive neurons. When glycemia falls down, these neurons are capable, by nervous pathway, to trigger the discharge of adrenaline at the level of the adrenal medulla. - Compare the role of the effector organs that correct the variations of glycemia: liver, muscles, and adipose tissue. - Know that the regulation of glycemia is the result 	<ul style="list-style-type: none"> - Analysis of experimental results showing the influence of glucagon on the concentration of glucose and hepatic glycogen. - Analysis of experimental results showing the influence of glucagon on the concentration of glucose in the blood and of the glycogen in the liver. - Analysis of experimental results on the secretion of hormones (insulin and glucagon) by the islets of Langerhans in function of the concentration of glucose. - Analysis of documents, of tables of given and of graphs. - Getting information from a text. - Searching in a CDI. 	<ul style="list-style-type: none"> - Receptors (α and β cells). - System of messengers (hypoglycemic and hyperglycemic hormones).

<p>4.2 Regulation of the arterial pressure.</p> <p>4.2.1 Measure and variations of the arterial pressure.</p>	<p>of equilibrium between the action of the hypoglycemic hormone and those of the hyperglycemic hormones.</p> <ul style="list-style-type: none"> - Specify that in regular conditions regulation is ensured by the antagonistic pancreatic hormones and that there is auto regulation by negative retrocontrol. - Notice that in the case of stress, the nervous system can interfere by acting on the adrenal medulla. <p>Draw a functional diagram on the regulation of glycemia.</p> <p>Know that the measure of the arterial tension is estimating, in a direct manner, the blood pressure in the humeral artery.</p> <ul style="list-style-type: none"> - Compare the maximal or systolic arterial pressure to the minimal or diastolic pressure. - Mention the techniques permitting a direct measure of the pressure inside the circulatory system. <ul style="list-style-type: none"> - Notice the normal and the pathological variations of arterial pressure. - Locate the intracardiac innervation and specify its role in the cardiac revolution. - Draw a functional diagram of the extracardiac innervation, sympathetic and parasympathetic. - Prove the action of the nervous centers and of the sympathetic and parasympathetic nerves on the cardiac frequency and the motor activity of blood vessels. - Infer that the sympathetic centers are cardio-accelerators and vaso-motor and that the 	<ul style="list-style-type: none"> - Analysis of results of: <ul style="list-style-type: none"> • recordings of pressure in the different parts of the circulatory system. • the arterial pressure in function of activities, constraints... - Analysis of experimental results relative to the cardiac automatism. - Analysis of documents and of tables of given. - Methodical analysis of experiments of stimulation and of sectioning. <p>- Analysis of the experimental</p>	<ul style="list-style-type: none"> - Recall the anatomy and physiology of the heart and that of the vascular system.
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medullary parasympathetic are cardio-moderators.

- Identify the different physiological parameters that can influence the arterial pressure.

results and of the clinical observations (cardiac flow, vasoconstriction, vasodilation, atherosclerosis,...).

Content	Learning objectives (Skills...)	Activities	Remarks
<p>5- Evolution of living things.</p> <p>5.1 Parental relationships between living things.</p> <p>5.1.1 Time framework of evolution of life.</p>	<ul style="list-style-type: none"> - Know the geologic time and its subdivisions into eras, periods... - Specify the criteria that define the unity of the living world. - Notice the diversity of the actual living world. - Recall the definition of species and its importance in the classification of the living world. - Notice that the living things are divided into prokaryotes and eukaryotes according to recent biological given. 	<ul style="list-style-type: none"> - Analysis of documents and of tables of given relative to geologic time. - Analysis of documents, of tables of given and of graphs. - Getting information from a text. - Analysis of sequences in a film. - Searching in CDI. 	<p>All the unit is suspended</p> <ul style="list-style-type: none"> - Mention: genetic code, proteosynthesis, ATP, meiosis, fertilization, chemical communication, the same nitrogenous bases. - Eukcaryotes: DNA constituents of cells organized in chromosomes present in a nucleus and the presence of other cellular organelles. - Prokaryotes: absence of differentiated cellular organelles, DNA strand free in the cytoplasm.

	<ul style="list-style-type: none"> - Notice the succession of species during the geologic times. - Notice that the evolution is the only scientific explanation that considers the unity and the diversity of the living world in addition to the changes occurring during the geologic times. 	<ul style="list-style-type: none"> - Analysis of documents and of tables of given relative to the: <ul style="list-style-type: none"> • appearance of vertebrates during geologic times. (study of fossils permitting to establish a chronological order). • phylogenetic links between the different vertebrates. 	
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Content	Learning objectives (Skills...)	Activities	Remarks
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<p>5.1.2 The search for parental relationships.</p>	<ul style="list-style-type: none"> - Notice that evolution implies a filiation between the species: members of the same species originate from common ancestors and are modified in time. It is probable that all living things have a common origin. - Find out the parental links between the living things from the morphological and anatomical characteristics. - Analyze embryonic characteristics to show that species resemble each other more by their embryos than by their adults. - Determine and compare the homologous molecules (proteins, genes): same structure, same function, variation in the nature of the sequence (aminoacids, or nucleotides). - Find out the parental links between living things by relying on the analysis of homologous molecules. - Define phylogeny as the science that establishes parental relationships by comparing the homologous molecules. - Construct and interpret a phylogenetic tree for qualitative probing. 	<ul style="list-style-type: none"> - Study of a fossilized lineage to illustrate a parental link between living things: case of horses' fossils. - Analysis of embryonic stages in vertebrates. - Comparison of documents relative to homologous molecules (enzymes, hormones) and to sequences of genes. - Analysis of sequences illustrating degrees of molecular parenthood to establish phylogeny between the species. 	<ul style="list-style-type: none"> - Qualitative probing is not required.
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Content	Learning objectives (Skills...)	Activities	Remarks
<p>5.3 Human evolution. 5.3.1 Criteria of human evolution.</p>	<ul style="list-style-type: none"> - Notice that the most evident cause of a reproductive isolation is the geographical isolation. - Know that the human evolution is the progressive acquisition of morphological and cultural characteristics of the human lineage, and also of language. - Compare the morphological, anatomical and cultural characteristics that distinguish the principal types of hominids. - Know the main evolutionary stages of hominids. 	<ul style="list-style-type: none"> - Getting information from a text. - Analysis of documents relative to the comparative study of moldings or reconstituted anatomical elements of the human species lineage; tools testifying their culture. - Analysis of documents relative to the main evolutionary stages of humans since the appearance of hominoids 4 to 1.4 MYA passing by the appearance of the genus Homo until the birth of the modern Man: Homo sapiens. 	<ul style="list-style-type: none"> - Mention certain Australopithecus, Homo habilis, Homo erectus, Homo sapien.
<p>5.3.2 Phylogenic relationships between Man and primates.</p>	<ul style="list-style-type: none"> - Notice the criteria of human evolution: bipedal walking, increase in the cerebral volume, appearance of language, acquisition of techniques and development of cultural activity. - Notice the phylogenic relations between modern Man and that of primates by a comparative study of karyotypes and homologous proteins. 	<ul style="list-style-type: none"> - Analysis of documents relative to the comparative study of karyotypes, of homologous proteins of 	

- Notice that a modification of certain genes of regulation, related to environmental changes, can be at the origin of the human lineage.

Man and of apes
(anthropomorphs).

REDUCTION OF THE LIFE SCIENCE CURRICULUM

3rd Year Secondary – Sociology and Economics Series

Content	Learning objectives (skills...)	Activities	Remarks
<p>2- 1. Nutrition and health.</p> <p>1.1 Diversity of food habits.</p> <p>1.2 The basic principles for a balanced diet</p> <ul style="list-style-type: none"> - Quantitative needs: Vitamins, amino acids, and mineral substances • Needs of Vitamins • Need of amino acids 	<p>-Specify the different types of vitamins and the role of each</p> <p>Deduce the importance of certain amino acids which must be found in food.</p>	<ul style="list-style-type: none"> - Getting information from text. - Search in a CDI. - Analysis of statistical data concernin - g an industrial country and results of surveys. - Observation and analysis of documents, tables or graphs. <p>-Analysis and studying of the source and role of different types of vitamins.</p> <p>- Probing experimental results: Experiments conducted on animals</p>	<ul style="list-style-type: none"> - Recall that consumed food is a mixture of mineral and organic substances. - Recall briefly the role of foods as source of matter and energy. It is not required to do a practical study of food. - Mention the existence of quantitative inequality of food between overnourished people and people that die of famine. - Recall the energetic values of the - Stress only the notion that vitamins (hydrosoluble vitamins: B, C and liposoluble vitamins: A,D,E,K) are organic substances essential in small amounts for the maintenance of good health and they are provided by food, and any deficiency leads to malnutrition disease: avitaminosis disease. - Needs of non-essential amino acids to build up body proteins

<p>1.4 Biological Renwal</p> <ul style="list-style-type: none"> • Needs of fatty acids • Needs of Minerals 	<p>Recognise that certain fatty acids are not synthesized by the body and that they must be supplied by food (particularly vegetable oil).</p> <ul style="list-style-type: none"> - Needs of mineral slats: Recognise that certain mineral elements such as iodine and fluorine are essential in a very small dose for the proper functioning of the organism, and that their total lack induces very serious troubles. - Recognise that the stability of living is not as it appears - Point out that the majority of cells in a body are continuously replaced and that their characteristics are maintained in spite of renewal. <p>Know that the constituting molecules of all cells are renewed without stop</p>	<p>(Magendie, Osborne, and Mendel)</p> <ul style="list-style-type: none"> - Probing the doc related to the nutritional or biological value of a protein and the information accompanying it. - Drawing information from a text or analysis of experimental results (experiment of Evans and Burr in 1928) - Observation and analysis of documents or graphs. - Drawing information from text or document - Observation of documents, skin section, blood smears,.. and evidences from daily life 	<p>(structural and functional proteins). Some aminoacids are produced in the body (nonessential aminoacids) while other aminoacids are not and should be supplied by protein rich food. (analysis of table showing the source of some of the non essential amino acids and their quantitative needs. The information is not for memorizing)</p> <ul style="list-style-type: none"> - Stress only the fact that certain fatty acids are not synthesized by the body and that they must be supplied by food (particularly vegetable oil). - Stress only the fact that certain mineral elements such as iodine and fluorine are essential in a very small dose for the proper functioning of the organism, and that their total lack induces very serious troubles. The sources and role of the different ions is not for memorizing.
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- Food Digestion and dissimilation
- Synthesis of molecules

- Recognise that continuous renewal of molecules compensates for loss occurring due to continuous degradation of intracellular materials in a manner which lets the organism maintain a dynamic equilibrium.
- Note that biological renewal might not happen except when the diet is balanced.
- Know that the molecules necessary for biological renewal are derived from nutrients produced by food digestion.
- Understand that nutrients are assimilated by the cells in order to construct their proper matter and insure biological renewal.
- Know that proteins are macromolecules synthesised according to a plan which imposes its sequence of amino acids on their manufacture.

Content	Learning objectives (skills...)	Activities	Remarks
<p>2. Neurobiology, human behavior and health.</p> <p>2.1 Social communication.</p> <p>- Aggressiveness.</p> <p>- Dominance.</p> <p>- Emotional and stress reactions.</p>	<p>- Recognize that social life involves inter-individual relations of diverse nature, and based on communication that may be expressed as aggressiveness, dominance and emotional reactions.</p> <p>- Understand that aggressiveness is a natural tendency to attack, which exists in the majority of species.</p> <p>- Take into account that aggressive behavior is linked to reality, innate disposition, and may result from frustration induced by an obstacle.</p> <p>- Point out that dominance is an individual tendency to control others behavior and establish and maintain a social structure based on a hierarchy.</p> <p>- Recognize that an individual is permanently subject to disturbances of various origins called stress, which constitute aggression towards his own organism.</p> <p>- Point out that too many situations may underlie stress.</p>	<p>-Analysis of documents.</p> <p>- Observation of documents</p> <p>- Drawing information from text</p> <p>- Analysis of sequence in a film</p> <p>- Getting information from text</p>	<p>-Draw attention to the fact that communication is achieved by exchange of signals (speaking, sings...) received by sensory receptors.</p> <p>-Mention that certain aggressions due to stress are greatly perceived (death, divorce...) and they provoke marked emotional reactions while others, such as the daily stress (traffic...) are not perceptible except when they are added.</p>

- Notice that the organism reacts to stress by visible, immediate, involuntary and adapted responses.
- Take into account that the organism's reaction towards stress is defense reactions which favor fight or flight.
- Recognize that certain reactions towards stress concern the functioning of internal organs while others affect behavior.
- Notice the existence of discreet responses in many situations of stress such as hormonal fluctuation.
- Note that an organism reacts sometimes in an unfavorable manner when it is under intense stress.
- Point out that regulatory and adapting reactions to stress involve intervention of sensory receptors, integrating nervous centers and effectors.
- Notice that the nervous system and the hormonal one function together to face stress.
- Point out that the hypothalamus plays an integrating role for the nervous and hormonal mechanisms.
- A behavioral act, in response to aggression, involves both the nervous and endocrine system.

- Analysis of graphs.
- Evidence from every day life.
- Analysis of a diagram showing the nervous mechanism acting during reaction to stress (cold...)
- Analysis of diagrammatic figure showing the different nervous and hormonal pathways.
- Drawing information from a text or a table.

- Recall briefly in the form of a general diagram the possible sense of nervous messages between receptors, nervous centers and effectors.

- The elements which interfere in regulating and adapting reactions to stress which are sensory receptors (eyes, ears, skin sensory receptors, as well as the receptors for blood pressure), nervous centers in the brain and mainly in the limbic system (without going into details about the limbic system) and effector organs (facial muscles, blood vessels, glands, etc..)
- The emotional response to transient stress like danger (fight or flight reaction) which is regulated by adrenaline secreted by the adrenal medulla gland. The latter is stimulated by nervous system (centers in the limbic system are involved).
- Adrenaline favors the increase of the frequency of cardiac activity, the respiratory activity, and the increase of glucose concentration in blood and redistributes blood to muscles. All these consequences tend to provide muscles with sufficient glucose and oxygen gas so that muscle tissues undergo cellular oxidation to produce sufficient energy needed for flight reaction.
- The emotional response to long term stress (suffering from chronic disease) which is regulated by Glucocorticoid hormones secreted by the adrenal cortex. The latter is

stimulated by nerve centers in the limbic system. Glucocorticoid favors the increase in blood glucose level and lowers the excretion of water from the kidneys and has an anti-inflammatory effect that helps the organism in resisting aggression. If long term stress persists for long duration it results in decreasing the concentration of released glucocorticoids (exhaustion phase) which result in weak immunity and other health problems that might lead to death.

Content	Learning objectives (skills...)	Activities	Remarks
<p>2.2 Nervous communication</p> <ul style="list-style-type: none"> - Nervous message - Synaptic transmission - Cerebral activity and conditioned reflex. 	<ul style="list-style-type: none"> - Note that the nervous impulse is a temporary electric signal which corresponds to inversion of polarisation of the neuron membrane. - Relate depolarisation which constitutes the action potential to alteration of neuron membrane permeability to Na and K ions. <ul style="list-style-type: none"> - Excitatory post synaptic potential (hypopolarization of post synaptic membrane) and Inhibitory synapse (hypeplarization of post synaptic membrane) - Point out that the human's brain consists of two cerebral hemispheres composed of white matter covered by a grey one which forms the cerebral cortex. - Note that the cerebral cortex contains an enormous quantity of neurons. - Recognise that the human cerebrum is a treatment center for complex nervous messages. - Understand that the cerebrum is the organ of the central nervous system at the origin of general sensitivity and general movement. - Point out that the cerebral cortex is 	<ul style="list-style-type: none"> - Analysis of documents. - Observation of documents - Drawing information from text - Analysis of sequence in a film - Getting information from text 	<ul style="list-style-type: none"> - Draw attention to the fact that communication is achieved by exchange of signals (speaking, signs...) received by sensory receptors. - Stress the fact that excitatory synapse allows the passage of nerve message while inhibitory synapses don't. - Point out the existence of excitatory synapses which permit passage of the nervous message, and opposing inhibitory ones on the same neuron.

<ul style="list-style-type: none"> • The cerebrum and conscious perception 	<p>divided into sensory areas, motor areas and associative ones.</p> <ul style="list-style-type: none"> – Note that the area of general sensitivity receives nervous messages sent by different receptors in the body, and that the psycho-sensitive areas integrate and interpret sensations to elaborate perception. – Specify the afferent sensory pathways and their synaptic relays. – Recognize that all voluntary actions are commanded by the motor area of the cerebral cortex. – Locate the motor area in the cerebral cortex. – Note that every part of the body is represented in the motor area as a function of its functional importance. – Specify the direct voluntary motor pathways and indirect ones (pyramidal and extra-pyramidal). – Indicate that the nervous motor pathways intersect and that every motor area commands the opposite half of the body. – Recognise that the psychomotor area allows co-ordination of voluntary movements. – Point out that voluntary movements are controlled by different levels of the central nervous system and that 	<ul style="list-style-type: none"> – Analysis of graphs – Evidence from every day life. – Analysis of a diagram showing the nervous mechanism acting during reaction to stress (cold...) – Analysis of diagrammatic figure showing the different nervous and hormonal pathways. – Drawing information from a text or a table. – Observation of a model or a frontal section of the cerebrum. – Microscopic observation of a section of the cortex. – Making use of experimental 	<ul style="list-style-type: none"> – Mention that certain aggressions due to stress are greatly perceived (death, divorce...) and they provoke marked emotional reactions while others, such as the daily stress (traffic...) are not perceptible except when they are added. – Recall briefly in the form of a general diagram the possible sense of nervous messages between receptors, nervous centers and effectors.
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<ul style="list-style-type: none"> • Voluntary action <p>2.3 Hormonal communication.</p> <ul style="list-style-type: none"> - Characteristics of the hormonal message 	<ul style="list-style-type: none"> - Compare the path of the nervous impulse throughout the innate reflex action of salivation to that throughout conditioned salivation. - Note that the important factor in conditioning is establishment of new nervous links between the nervous centers. <ul style="list-style-type: none"> -Recognise that inside an organism, different groups of cells communicate among one another by hormonal messages. - Understand that a hormone is a chemical compound produced by an endocrine gland and then liberated in small amount into the internal medium acting as a means of transport. 	<ul style="list-style-type: none"> - Observation and analysis of a diagrammatic section of the motor area (homunculus) - Analysis of a document showing the two great motor tracts. <ul style="list-style-type: none"> - Analysis of a document showing the multiple nervous mechanisms intervening in a voluntary movement - Recall in the form of a diagram the anatomical elements of the pathway of the Nervous message during a simple reflex. 	<ul style="list-style-type: none"> -Draw attention to the fact that paralysis of the right half of the body may be induced by destruction of the left motor area.
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<ul style="list-style-type: none"> • Elaboration and transportation of hormonal messages. 	<ul style="list-style-type: none"> – Note that endocrine glands manufacture and secrete hormones under the effect of nervous, hormonal or mixed stimulations. – Point out that production of hormones is carried out in steps: taking raw materials from the blood, synthesis and later secretion. – Note that hormones act on target cells and modify their activity. – Point out that responding of target cells to hormonal messages requires temporary binding between the hormone molecules and receptors located on the membrane or inside the target cell. 	<ul style="list-style-type: none"> – Analysis of a text about pavlov’s experiment – Drawing information from text – Drawing information from text – Drawing information from text – Analysis of documents 	<ul style="list-style-type: none"> - Mention that spinal reflexes or bulbar ones are innate
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<p>- Neuro-hormonal integration.</p> <ul style="list-style-type: none"> • Complementary of the nervous and hormonal systems. • Role of the hypothalamus. <p>2.5 Biological rhythms.</p>	<ul style="list-style-type: none"> - Recognise that certain activities the body involve some complementarity between nervous and hormonal mechanisms. - Take into account the integrating role of the hypothalamus in neuro-hormonal correlation. - Recognise that biological rhythms are periodic variation of the functions of the body. - Point out the existence of biological rhythms at all levels of the organism. - Note that the well known biological rhythms are the circadian ones or those with medium frequency. - Notice that sleep is a phenomenon that passes in many phases. - Notice that the awakening-sleep rhythm changes and progressively throughout life. 	<p>-Analysis of documents</p>	<p>- Limited to only one endocrine gland (the thyroid pancreas...)</p>
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<p>- Synchronisation of endogenic rhythms.</p>	<ul style="list-style-type: none"> - Note that the troubles of sleep are very frequent , and that anxiety is often the cause, and that proper hygiene may prevent those troubles. - Point out that biological rhythms have an endogenous origin but they are synchronised by environmental factors. 	<ul style="list-style-type: none"> - Observation of a microscopic section of an endocrine gland - Analysis of documents - Analysis of documents - Analysis of documents and graphs - Analysis of documents 	<ul style="list-style-type: none"> - Draw attention to the existence of circannual rhythms... - The mechanism of sleep is not required. - Chronobiology: study of biological rhythms. - Pharmacology: science of
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<p>- Applications of chronobiology</p>	<ul style="list-style-type: none"> - Point out that in the human kind, the principal synchronisation is the rhythm imposed by the social context: the schedule of activity and rest. - Notice that the body presents a periodic variation in its susceptibility to administered chemical substances. - Deduce that the conditions of life and work may disturb the biological rhythms. 	<ul style="list-style-type: none"> - Probing documents which show the relation between the hypothalamus, hypophysis, glands and target cells. - Analysis of a table of data - Analysis of documents - Analysis of a hypnogram - Analysis of sequence in a film - Analysis of documents - Drawing information from text <ul style="list-style-type: none"> - Getting information from text which provides experimental results. - Getting information from text - Analysis of graphs which represent the interference between the biological rhythm and the time of 	<p>drugs, i.e. natural or synthetic chemical substances capable of inducing a biological response.</p> <ul style="list-style-type: none"> - Give as an example the work by shifts. - Chronopharmacology: study of the effects of medicines according to the time of their administration.
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		administration of medicines. Drawing information from a text or a document.	
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Content	Learning objectives (skills...)	Activities	Remarks
3.Theories of evolution 3.2. the process of evolution through molecular biology and palaeontology	<ul style="list-style-type: none"> - Recognise that evolution is modification of living structures in time. - Establish that the differences between homologous molecules (insulin, hemoglobin...) result in evolution from a common model. - Note that the comparison between the genes coding for homologous molecules allows to establish phylogenetic relationships. - Point out that the data of palaeontology confirm that the actually living things do not resemble their ancestors. 	<ul style="list-style-type: none"> -Analysis of documents -Analysis of documents. - Analysis of documents (horse legs, human skill...). - Analysis of documents. 	<ul style="list-style-type: none"> -Phylogeny: evolutionary history. -Palaeontology: the science which studies fossils. -Mention that fixism is a doctrine which affirms steadiness of species.

<p>3.2. from old theories to the synthetic theory</p>	<ul style="list-style-type: none"> - Note the principal points of the transformist theory of Lamarck. - Point out the principal points of Darwin's theory: evolution by natural selection. - Note the different points of the mutationist theory of Hugo de Vries: evolution occurs by mutation and the species are stable outside mutations. - Note that biologists admit currently a synthetic theory according to which evolution is transformation of populations and not single individuals by the action of natural selection. 	<ul style="list-style-type: none"> - Analysis of a text by Lamarck. - Analysis of documents - Analysis of a text by Darwin. - Getting information from text. - Analysis of documents (the pepper moth, resistant bacteria to antibiotics, resistant insects to insecticides...) 	<ul style="list-style-type: none"> -The synthetic theory is also called Neo-Darwinism. -Without detailed description of all forms, the great steps of hominids evolution would be treated starting from australopithecines.
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Content	Learning objectives (skills...)	Activities	Remarks
4.2 Improvement of the species: Hybridization, selection genetic experimentation.	<ul style="list-style-type: none"> - Recognize the improvement of the species consists of assembling maximum favorable characteristics that have an economic interest. - Know that hybridization is crossing members belonging to different strains of the same species. - Know that the principle of selection consists of reproduction of the chosen individuals with the most desirable characteristics to raise a whole population of the new strain and thus improving the species. 	<ul style="list-style-type: none"> - Analysis of a document. 	

	<ul style="list-style-type: none">- Note that the techniques of species improvement are various: hybridization, selection and genetic manipulation.- Recognize that many breeds of animals and plants (dogs, horses, wheat, corn...) were raised by hybridization and selection.	<ul style="list-style-type: none">- Analysis of documents.	<ul style="list-style-type: none">- Confined to one example of each technique.
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<p>4.3 Industrial breeding and agricultural research:</p> <ul style="list-style-type: none"> - Selection of productive breeds and research of new food sources. 	<ul style="list-style-type: none"> - Point out that industrial breeding is the production of a great quantity of animal which a good quality to meet the consumers demands, and to insure great profit to the breeder. - Cite the conditions of breeding. - Know that agricultural research aims at satisfying the needs which leads to production of animals and improving their products.- Note the animal nutrition la rationalized to limit the cost and avoid the animals obesity. 	<ul style="list-style-type: none"> - Observation and analysis of documents. - Getting information from text. - Analysis of documents. 	<ul style="list-style-type: none"> - Mention for information the methods of birth control in animals. <p>Draw attention to proteic seeds used as food for animals.</p>
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<p>4.4 Biotechnology and the environment.</p>	<ul style="list-style-type: none"> - Point out that growing agricultural and industrial production leads consequently to increase of atmospheric, fresh water and sea water pollution which forms a danger to the environment. - Know that the size of damage implies regulations for the protection of the environment on an international scale. -Point out that biotechnology contribute to the improvement of the environment. 	<ul style="list-style-type: none"> - Observation and analysis of documents, and inquiry on the use of nitrates, pesticides, and herbicides in agriculture. - Analysis of documents on biodegradation of hydrocarbons by microorganisms... 	
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