OBSERVATORY, The Human Organism – First Year of Secondary Cycle Two

APPLIED SCIENCE AND TECHNOLOGY (AST)
Overview of learning and evaluation situations (LES)

Note: Abbreviations used: **LES** for **learning and evaluation situation**, **SSC** for **subject-specific competency** and **CCC** for **cross-curricular competency**.
In the column Program content, *related concepts* are written in italics.

Learning and evaluation situations (LES)	Description	Duration	Broad area of learning	Competencies evaluated	Program content (developed concepts and *related concepts*)	Fields of applied technology
LES1 – A legal investigation	Various businesses in a certain municipality have been mysteriously robbed. To help find the culprits, authorities ask students to conduct a variety of tests to uncover the characteristic properties of samples taken by investigators.	4 periods	Career Planning and Entrepreneurship	SSC1 – Science CCC5	**The Material World:** Characteristic physical properties (melting point, boiling point, density, solubility), characteristic chemical properties (reaction to indicators), pure substance (compound, element), *homogeneous and heterogeneous mixtures* **The Living World:** *DNA*	**Medical technologies**
LES2 – For better and for taste	Students are asked to analyze a company's frozen desserts to produce a new recipe that better meets the needs of target clientele. Then, they are required to prepare 100 g of this dessert and put together its nutritional information chart.	4 periods	Health and Well-Being	SSC2 – Science CCC1	**The Living World:** Types of nutrients (water, proteins, carbohydrates, fats, vitamins, minerals), energy value of different nutrients, *digestive tract, transformation of food, digestive glands* **The Material World:** *Physical changes (state change, forms of energy (thermal, particle model, properties of solutions (concentration, solute, solvent), homogeneous and heterogeneous mixtures*	**Agricultural and agro-food technologies**
LES3 –Custom-made chairs	The municipal library has ordered ergonomic reading chairs. Students need to design an armchair in multiview projection at a scale of 1:10 adapted to a target clientele (children, tall adults, etc.).	4 periods	Career Planning and Entrepreneurship	SSC2 – Science CCC7	**The Technological World:** Geometric lines, forms of representation (sketch, perspective drawing, oblique projection), basic lines, orthogonal projections (multiview, isometric), dimensioning, *scales* **The Living World:** *Musculoskeletal system, central nervous system*	**Manufacturing technologies**
LES4 – Testing your metal!	A firm has developed a highly original pre-employment test. Candidates are required to work in teams to design and manufacture a technical object, a coin sorting machine in this case. Each candidate makes one part of the object according to the instructions shown on the exploded view drawing, with close attention to the dimensions and tolerances provided. If each team member does his or her part of the job correctly, the finished technical object will function as it should.	4 periods	Career Planning and Entrepreneurship	SSC1 – Tech CCC7	**Technological World:** Axonometric projection: exploded view (reading); dimensioning and tolerances; types and properties: plastics (thermoplastics); *orthogonal projections (multiview, isometric)*	**Manufacturing technologies**

Overview of learning and evaluation situations (LES) (*continued*)

Learning and evaluation situations (LES)	Description	Duration	Broad area of learning	Competencies evaluated	Program content (developed concepts and *related concepts*)	Fields of applied technology
LES5 – Blood, the gift of life	Medical personnel must administer a great many blood transfusions after a disastrous train accident near Barachois, a village in the Gaspé Peninsula. Hospital administrators order personnel to analyze the victims' blood compatibility and determine wthether there is an adequate blood supply on hand to treat those victims. Students make blood compatibility analyses and decide whether a blood drive is needed.	4 periods	Citizenship and Community Life	SSC2 – Science CCC3	**Living World:** Functions of blood constituents (plasma, formed elements); compatibility of blood types; *central nervous system (brain, spinal cord); circulatory system (types of blood vessels); lymphatic system (antibodies); process: cell culture*[1] **Material World:** *Heterogeneous and homogeneous mixtures; chemical changes*	**Medical technologies**
LES6 – A magic box	Students need to build a magic box using plane mirrors to create an optical illusion. To achieve this, they must design a plan, make a technical drawing and build a prototype.	4 periods	Career Planning and Entrepreneurship	SSC1 – Tech CCC4	**The Material World:** Deviation of light waves, *electromagnetic spectrum* **The Technological World:** Standards and representations (diagrams and symbols), sections and cross sections, dimensioning and tolerance **The Living World:** *Sensory receptor (eye)*	**Manufacturing technologies**
LES7 – Going round in circuits	Students analyze and diagram an electrical circuit. This enables them to verify the operation of a technical object and suggest necessary repairs.	4 periods	Career Planning and Entrepreneurship	SSC2 – Tech CCC5	**Technological World:** Power supply; conduction, insulation and protection; control (types: blade, push-button, rocker, magnetic contact); *standards and representations (diagrams and symbols)*	**Energy technologies**
LES8 – A well-planned model	One million dollars will be allotted for the creation of a new animated film in which action takes place inside the human body. Students are asked to help design the setting for the film. They are to carry out the research and build a model based on one of the systems linked to nutrition.	6 periods	Health and Well-Being	SSC3 – Science CCC9	**The Living World:** Digestive tract (mouth, esophagus, stomach, small intestine, large intestine, anus), transformation of food (mechanical, chemical), digestive glands (salivary glands, gastric glands, pancreas, liver, intestinal glands), respiratory system (nasal passages, pharynx, trachea, bronchi, lungs), circulatory system (types of blood vessels), lymphatic system (lymph, antibodies), urinary system (kidneys, ureter, bladder, urethra), maintaining a balanced organism (kidneys, lungs, sweat glands) **The Technological World:** *Forms of representation, scales*	**Information and communications technologies**
LES9 – Speak louder, please	Students become members of the R&D team of an engineering firm. Their job is to analyze the operation of a loud speaker in order to draw the design plan of a device for measuring the intensity of sound vibrations produced by speakers.	4 periods	Health and Well-Being	SSC2 – Tech CCC4	**Material World:** Amplitude; wavelength; frequency; *decibel scale* **Living World:** *Sensory receptors (eye, ear, skin, tongue, nose)* **Technological World:** *Standards and representations (diagrams and symbols)*	**Information and communications technologies**

1. Concepts of biotechnology in the *Observatory* series are part of the Living World; in the Québec Education Program, part of the Technological World.

Overview of learning and evaluation situations (LES) (*continued*)

LES10 – Expedition to the Far North	In the context of an adventure tourism workshop, students must plan an expedition to the Far North. They will determine via experiment the amount of fuel required to obtain enough water from the snow or ice for their daily meal preparations.	4 periods	Environmental Awareness and Consumer Rights and Responsibilities	SSC1 – Science CCC2	**The Material World:** Physical changes (dissolution, dilution, phase change), forms of energy (chemical, thermal, mechanical, radiation), particle model **The Living World:** *Types of nutrients (water, proteins, carbohydrates, fat, vitamins, minerals), energy value of different nutrients*	**Agricultural and agro-food technologies**
LES11 – Take a deep breath	Young scientists have won first prize in a contest with their spirometer prototype. Students will assemble a spirometer and analyze its operation in order to suggest modifications needed to market the instrument successfully.	5 periods	Health and Well-Being	SSC2 – Tech CCC8	**The Material World:** Compressible and incompressible fluids, pressure, relationship between pressure and volume, *respiratory system (nasal passages, pharynx, trachea, bronchi, lungs)* **The Technological World:** *Standards and representations (diagrams, symbols)*	**Medical technologies**
LES12 – The best ride	Students work in teams to design a miniature amusement park ride (merry-go-round, ferris wheel or roller coaster) that will be made out of wood, cardboard or plastic.	4 periods	Career Planning and Entrepreneurship	SSC1 – Tech CCC7	**Technological World:** Shaping: machines and tools; manufacturing: roughing and finishing, characteristics of laying out; measurements: direct measurement (ruler); *orthogonal projections (multiview, isometric); linking of mechanical parts; types of functions; mechanical properties; constraints (tension, compression, torsion); types and properties: ferrous alloys, nonferrous metals and alloys, wood and modified wood*	**Construction technologies**
LES13 – Addiction, the price to pay	At the end of an internship in a drug treatment centre, students present a poster to a patient that illustrates the effects (desirable and undesirable) on the body that are caused by the substance(s) he or she abuses.	5 periods	Health and Well-Being	SSC2 – Science CCC2	**The Living World:** Central nervous system (brain, spinal cord), peripheral nervous system (nerves), musculoskeletal system (bones, joints, muscles), puberty (male and female), hormone regulation in men (spermatogenesis, erection, ejaculation), hormone regulation in women (oogenesis, ovarian cycle, menstrual cycle), *digestive system, circulatory system, respiratory system, excretory system* **The Material World:** *Chemical changes, properties of solutions*	**Medical technologies**
LES14 – Driving safely	Small eco-friendly vehicles are increasingly popular. To evaluate the safety of these new models, students must build a miniature prototype of an eco-friendly vehicle and analyze its material constraints during frontal collision tests.	4 periods	Media Literacy	SSC1 – Tech CCC5	**The Technological World:** Constraints (tension, compression, torsion), mechanical properties, types and properties (ferrous alloys, nonferrous metals and alloys, wood and modified wood) **The Living World:** *Musculoskeletal system (bones, joints, muscles), tissues, organs, systems* **The Material World:** *Pressure, form of energy (mechanical)*	**Transportation technologies**
LES15 – Antioxidants at work	A company specializing in produce marketing is looking for a department manager for its research unit on storage and conservation methods. In response to this job offer, students must design an experiment to determine if soaking pieces of apple in a vitamin C solution is a good method to keep them from oxidizing.	4 periods	Environmental Awareness and Consumer Rights and Responsibilities	SSC1 – Science CCC7	**The Material World:** Homogeneous and heterogeneous mixtures, properties of solutions (concentration, solute, solvent), physical changes (dissolution, dilution), *chemical change (oxidation), particle model* **The Living World:** *Types of nutrients (water, proteins, carbohydrates, fats, vitamins, minerals), transformation of food (mechanical, chemical), processes*[1] *(pasteurization, genetic transformation [GMOs])*	**Agricultural and agro-food technologies**

Overview of learning and evaluation situations (LES) (*continued*)

Learning and evaluation situations (LES)	Description	Duration	Broad area of learning	Competencies evaluated	Program content (developed concepts and *related concepts*)	Fields of applied technology
LES16 – An artificial limb	An orthopedic robot based on the exoskeleton could revolutionize the daily life of people with impaired mobility. Students are to draw up plans for a part of an exoskeleton that will perform a specific function (e.g. picking up an object). Students should look to everyday objects for inspiration.	4 periods	Career Planning and Entrepreneurship	SSC1 – Tech CCC8	**The Technological World:** Types of functions, linking of mechanical parts, motion-transmission system function, components and use (friction gears, pulleys and belt, gear assembly, sprocket wheels and chain, wheel and worm gear), motion-transmission system function, components and use (screw gear system, cams, connecting rods, cranks, slides, rotating slider crank mechanisms, rack-and-pinion drive), *standards and representations, materials* **The Living World:** *Musculoskeletal system*	**Medical technologies**
LES17 – It's more than a common sense	Navspat, an aerospace industry leader, is seeking to recruit people with highly attuned senses who could immediately detect any possible flaws during space flights. Students will design a sensory acuity test that they will administer to themselves and then to classmates.	5 periods	Career Planning and Entrepreneurship	SSC1 – Science CCC4	**The Living World:** Sensory receptors (eye, ear, skin, tongue, nose), *central nervous system, peripheral nervous system* **The Material World:** Decibel scale, focal point of a lens, *frequency, wavelength, amplitude, electromagnetic spectrum, deviation of light waves, physical changes, chemical changes* **The Technological World:** *Geometric lines, standards and representations*	**Medical technologies**
LES18 – Biotechnology?	Students write an article about one of these biotechnologies: manufacture of a vaccine, cell cultures, pasteurization or artificial insemination.	6 periods	Media Literacy	SSC2 – Science CCC6	**Living World:** Mitosis, cell (cell components, cell membrane, nucleus, chromosomes, genes);[2] meiosis; genetic diversity; processes:[1] pasteurization, manufacture of vaccines, artificial insemination, cell culture; *hormone regulation in women (oogenesis, ovarian cycle, menstrual cycle); hormone regulation in men (spermatogenesis, erection, ejaculation)*	**Information and communications technologies**

1. In the *Observatory* series, the concept of biotechnological processes is assigned to the *Living World*. In the QEP, it is classed in the *Technological World*.
2. In the *Observatory* series, the cell concept is assigned to the *Living World*. In the QEP, it is classed in the *Technological World*.