# France Educational Curriculum Alignment

The presentations offered by The Educated Choices Program provide support for teaching and learning of the following standards:

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<th>Physics &amp; Chemistry for Health - tech path, specialist courses, High School</th>
<th>Environment and Modern Agriculture</th>
<th>Healthful Eating</th>
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<td>Chemical and electrical safety in the home</td>
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<tr>
<td>Concepts and content</td>
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<td>Required knowledge and skills</td>
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<tr>
<td>Students will be able to define and interpret:</td>
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<tr>
<td>● Experimental training support activities</td>
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<tr>
<td>● How to use acidic household products or safe basics</td>
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<tr>
<td>● Quantity of matter, relation between mass and quantity of matter</td>
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<tr>
<td>● Solute and solvent</td>
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<td>● Mass concentration C_m and molar concentration C of a solute in solution</td>
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<td>● pH of an aqueous solution [H_3O^+] = 10^-pH</td>
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<tr>
<td>● Measurement of the pH of a solution aqueous</td>
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<tr>
<td>● Acid, base, acid/base couple, acid-base reaction</td>
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<tr>
<td>● Scales of acidity and basicity, acidic, basic aqueous solution, neutral</td>
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<tr>
<td>● Autoprotolysis of water, product water ion, concentrations molars [H_3O^+] and [HO^-]</td>
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</table>
- Safety pictograms
- Chemical Safety Rules relating to acids and bases

Students will be able to:
- Calculate a molar mass $M$. Know and use the relation $n = m/M$.
- Define a solute, a solvent and a solution.
- Know and use the $n = C \times V$ and $m = Cm \times V$ relationships.
- Propose and/or implement a protocol for dissolution and dilution to prepare a solution of molar concentration or mass concentration given as a molecular or ionic solute.
- Know and use the relationship $[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$. Set the neutral, acidic or basic character of an aqueous solution in terms of pH.
- Propose and/or implement an experimental protocol to measure the pH of an aqueous solution.
- Define an acid and a base according to Brönsted. To write the equation of an acid-base reaction from the couples acid/base.
- Know the common name and formulas of most common acids and bases: acid hydrochloric acid, ethanoic acid, sulfuric acid, soda, ammonia.
- Write the equation for the self-protolysis reaction of water.
- Use, without calculation, the expression of the ionic product of water to qualitatively relate the concentrations $[\text{H}_3\text{O}^+]$ and $[\text{HO}^-]$.
- Propose and/or implement a protocol for classification of household products according to their acidity.
- Know the meaning of the safety pictograms.
- Apply the safety rules related to the use of concentrated acidic and basic solutions, and to their mixed. Know the first aid actions in case of acid or base splash.
- As part of waste management, implement a protocol for neutralizing an acid solution with a basic solution or vice versa.
<table>
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<th>How can disinfectants and antiseptics be used safely?</th>
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<td>• Oxidizer, reducer, couple oxidant/reducer, redox half equation, redox reaction</td>
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<td>• Oxidizing properties of some household products and pharmaceuticals stock qualitative antiseptic of a oxidant on a microorganism</td>
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<td>• Dilution of an aqueous solution</td>
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<td>• Safety rules relating to the use of oxidizing products</td>
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Students will be able to:  
• Define an oxidant and a reducer.  
• Identify an oxidizer and a reducer in a redox half equation.  
• Write the equation of a redox reaction from oxidation-reduction half-equations.  
• Acquire and analyze property information oxidants of a disinfectant or an antiseptic (bleach, tincture of iodine, medical alcohol, water oxygen, etc.).  
• Propose and/or implement a dilution protocol for a disinfectant or antiseptic product.  
• Explain the risk associated with mixing bleach and of a descaling product by commenting on the reaction corresponding.  
• Qualitatively explain the origin of the aging of oxygenated water.  

How are electrical risks in the home limited?  
• Sinusoidal alternating voltage.  
• Period, frequency, values maximum and minimum, value efficient  
• Electric current intensity  
• Electrical hazards  
• Damage to devices  
• Electrification and electrocution
- Power socket: phase, neutral, grounding

Students will be able to:
- Know the characteristics of the mains voltage.
- Use an oscillogram.
- Define electric current and its intensity.
- Relate the intensity of the electric current to the deterioration of electrical appliances. Describe the principle of a circuit breaker.
- Know that the human body conducts electricity. To master the rules to follow in order to avoid the risks of electrification.
- Describe the importance of grounding when connection of electrical devices.
- Implement a protocol to show interest in a circuit breaker.

How is infrared used in certain detection systems?
- Wave domain
- Electromagnetic
- Temperature of a body and emitted radiation. Wien's law
- Infrared emission by the human body

Students will be able to:
- Know the wavelength limits in vacuum of the visible range and locate infrared radiation and ultraviolet.
- Know that the human body emits radiation infrared, invisible to the naked eye and safe for the man.
- Exploit the graphical representation of Wien's law in order to show that the human body emits infrared radiation.
- Collect and use information on the use of infrared radiation in some detectors.
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<th>Road safety</th>
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How does a vehicle’s speed affect its stopping distance?
- speed of a body, energy
- translational kinetics
- Braking distance, distance stop

Students will be able to:
- Know and use the expression for kinetic energy.
- Know the definition of braking and stopping distances of a vehicle.
- Appropriate and analyze information relating to braking distances.
- Know a few factors influencing the stopping distance.
- Implement an experimental protocol or use a simulation software to illustrate the influence of some factors (speed, mass, road condition, etc.) on the stopping distance.

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<th>Theme 2: Analyze and diagnose</th>
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<td>Sound waves in the hearing process</td>
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What are the characteristics of a sound?
- Frequency and pitch of a sound
- Audible sounds
● Sound intensity level (dB)

Students will be able to:
● Know the range of frequencies audible to the ear human. Locate ultrasound and infrasound.
● Distinguish between bass, midrange and treble.
● Make and use a sound recording to determine the characteristics of a sound.

How is hearing loss identified and compensated?
● Perception of sound by the ear
● Human hearing risks
● Compensation for a deficiency auditory; amplification of sound

Students will be able to:
● Briefly explain the principle of issuing, propagation and perception of sound.
● Measure sound intensity levels.
● Analyze an audiogram in terms of hearing loss.
● Explain the principle of compensation for a deficiency auditory.

The propagation of light in the process of vision

Concepts and content
Required knowledge and skills
Experimental training support activities

What is the mechanism of human vision?
● Light spread
● Brief description of mechanism of vision
Students will be able to:
- Know that light travels in a straight line in a homogeneous and transparent medium.
- Know the main optical components of the eye and their respective roles: cornea, iris, pupil, lens, retina and optic nerve.
- Represent the optical model of the eye.

How is an image formed using a lens?
- Spherical thin lenses convergent and divergent; symbols
- Optical center O, object foci F and image F’ of a lens
- Focal distance f’ and vergence V
- Formation of an image by a converging lens character real or virtual of the image, magnification
- Principle of the magnifying glass

Students Will be able to:
- Trace the course of the light rays passing through the points O, F and F’ of a converging or diverging lens.
- Geometrically construct the image of a real object by a converging lens.
- Characterize an image by its property of being real or Virtual.
- Evaluate its growth by construction geometric.
- Implement imaging experiments by a converging lens in simple situations.

How are vision defects corrected?
- Accommodation
- Vision defects: myopia, farsightedness and presbyopia
- Compensation of a hyperopia and myopia by corrective lenses
- Vergence of a system of two thin contact lenses
### Students will be able to:
- Explain the principle of accommodation and the origin of presbyopia.
- Implement an experiment illustrating the principle of accommodation.
- Give the definition of a myopic eye and that of a farsighted.
- Qualitatively justify the choice of a corrective lens.
- Implement experiments that qualitatively illustrate the principle of correcting an eye defect.
- Know and use the expression of the vergence of a system of two thin lenses placed side by side.

**The properties of fluids in the analysis of blood pressure**

- Concepts and content
- Required knowledge and skills
- Experimental training support activities

**How to define the flow rate of a flow?**
- Flow, relationship between flow, flow velocity and section
- Relationship between cardiac output DC, heart rate fC and stroke volume VES

### Students will be able to:
- Know and apply the relationship \( D = v \times S \).
- Know and apply the relationship \( DC = fC \times VES \).
- Implement an average throughput measurement protocol.
- Implement a speed measurement protocol flow average.

**How to define the pressure in a liquid?**
- Pressing force and pressure; international units
Students will be able to:
- Know and apply the relationship \( P = \frac{F}{S} \)

**How does the pressure in a liquid vary?**
- Variation of the pressure with the depth, fundamental law of fluid statics

Students will be able to:
- Use the relation \( P_2 - P_1 = g(z_1 - z_2) \).
- Implement a verification protocol fundamental to the statics of fluids.

**How is blood pressure defined and measured?**
- Systolic blood pressure and diastolic
- Principle of measuring tension.
- Centimeter of mercury

Students will be able to:
- Distinguish blood pressure and blood pressure.
- Appropriate and analyze documents relating to blood pressure measurements.

**Chemical analysis to control the composition of biological media**

- Concepts and content
- Required knowledge and skills
- Experimental training support activities

**How to describe organic molecules?**
- Raw formula, developed, semi-developed and topological
- Covalent bonds
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<th>Carbon skeleton</th>
<th>Functions</th>
<th>Constitutional isomerism</th>
<th>Nomenclature</th>
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Students will be able to:
- Switch from one type of representation to another.
- Know the number of covalent bonds for the H, C, O and N atoms.
- Build and operate molecular models.
- Utilize molecular model visualization software.
- Know and identify the functions alcohol, aldehyde, ketone, carboxylic acid, ester, etheroxide, amine, amide on simple examples.
- Identify isomers from distinctions in the carbon chain, functions or spatial arrangement.
- Name alkanes, alcohols, carboxylic acids and common carbonyl derivatives at six carbon atoms at most.

What is the structure of molecules of biological interest?
- Carbohydrates
- Lipids from examples saturated fatty acids or unsaturated, triglycerides, sterols
- Alpha amino acids, proteins
- Polypeptides, peptide bond
- Urea
- Vitamins

Students will be able to:
- Identify some functions present in carbohydrates, lipids, proteins.
- Know that the molecules of glucose, fructose and lactose exist in linear or cyclic form.
• Implement a protocol to differentiate aldehyde and ketone functions in carbohydrates.
• Define a fatty acid, a triglyceride.
• Comment on the saturated or unsaturated structure of some fatty acids: α-linoleic acid, palmitic acid, acid oleic, stearic acid.
• Define an alpha amino acid.
• Identify a peptide bond. Identify acids and amino constituents of a polypeptide.
• Know that urea is the breakdown product of proteins.
• Highlight the chemical properties of the vitamin C in relation to its chemical functions.

How does the molecular structure of water explain its physical properties and its interaction with molecules of biological interest?
• Water, polar molecule
• Physical states of water
• Hydrogen bond
• Solubility of substances molecules in water
• Hydrophobic and hydrophilic
• Miscibility
• Aqueous phase and phase organic

Students will be able to:
• Define a polar bond.
• Give the representation of the water molecule taking into account the comparison of the electronegativity of hydrogen and oxygen atoms.
• Know the temperatures of change of state of water at atmospheric pressure.
• Simply highlight the levels of fusion and vaporization at atmospheric pressure, and the thermal effect physical changes.
- Represent a hydrogen bond. Interpret qualitatively the difference in the volumes occupied by the ice and liquid water.
- Qualitatively justify the solubility of carbohydrates in the water.
- Qualitatively interpret micelle formation.
- Propose and/or implement a protocol illustrating the solubilities of different molecular substances.
- Locate the aqueous and organic phases from the given densities.
- Propose and/or implement a phase separation protocol and a protocol extraction.

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<th>Theme 3: Making autonomous and responsible choices</th>
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What are the energy needs of humans?
- Daily energy expenditure
- Heat transfers by radiation, convection and conducting; application to the body human energy conversion, application to muscle activity
- Endothermic transformations and exothermic

Students will be able to:
- Define daily energy expenditure.
- Use the relationship of Harris and Bénédict making it possible to estimate the daily energy expenditure.
- Know the units of energy (calories, joules and kilojoules) and their correspondence.
- Experimentally highlight the transfers heat by convection and conduction.
- Identify the different forms of heat loss from organisms (by radiation, by convection, by conduction, evaporation).
- Experimentally demonstrate a conversion of energy.
- Establish the energy balance for a muscle by action (conversion of chemical energy into heat and mechanical energy).
- Practice an experiential approach to put in place demonstrates the thermal effect of a physical transformation or chemical.
- Define endothermicity and exothermicity of a physical or chemical transformation.
- Appropriate and analyze documents relating to endothermicity or exothermicity of a transformation physical or chemical in the body.

How are human energy needs satisfied?
- Food, fuels of the human body
- Energy value of food

Students will be able to:
- Implement a protocol to identify the presence of carbohydrates, proteins, lipids and certain minerals in food.
- Extract data relating to the energy provided by each food group.
- Define calories.
- Calculate the calorific value of a food.
- Calculate the energy delivered by a food ration.
- Implement a protocol to determine the energy released by burning food.

How do the biochemical transformations of food produce energy?
- Energy aspect of biochemical transformations
- Glucose transformations in the body
- Combustion reaction
Hydrolysis reaction

Students will be able to:
● Exploit the energy value delivered by the transformation of carbohydrates, lipids, proteins.
● Do the link with the property of carbohydrates to constitute the main sources of energy.
● Write the chemical equations of the transformations of aerobic and anaerobic glucose.
● Define a combustion reaction, write and use its equation.
● Treat cases of glucose and pyruvic acid.
● Define a hydrolysis reaction, use its equation.
● Write the equation for the hydrolysis reaction of lactose.
● Link the transformation of nutrients and the oxygen demand in athletes.

The role of biomolecules in the body for effective health prevention

-Concepts and content
-Required knowledge and skills
-Experimental training support activities

How are carbohydrates stored and processed in the body?

Classification of carbohydrates: simple and complex carbohydrates.
● Carbohydrate isomerism
● Chemical transformation of complex carbohydrates: hydrolysis acid, enzymatic hydrolysis
● Condensation of glucose into glycogen
Students will be able to:

- Define a simple carbohydrate and a complex carbohydrate.
- Identify the chemical functions present in a carbohydrate.
- Recognize isomers.
- Write the equation of the hydrolysis reaction of a carbohydrate complex.
- Implement an experimental hydrolysis protocol of a complex carbohydrate.
- Implement an experimental protocol to carry out without formalism a kinetic study of the hydrolysis of starch.
- Define a polymer.
- Recognize a glucose polymer.
- Appropriate and analyze documents relating to the storage of carbohydrates by the body, their content and the blood sugar control.

Responsible management of natural resources for human food

- Concepts and content
- Required knowledge and skills
- Experimental training support activities

What factors determine the use of essential natural resources?

- Chemical potability criteria of a water
- Origins of water pollution

Students will be able to:

- Comment on the ionic composition of different waters drinking water (tap water, mineral water, spring water).
- Interpret quantitative results on composition of water compared to reference data.
- Linking water consumption by human beings to their daily trace element requirements.
- Know the main causes of water pollution terrestrial and underground.
- Appropriate and analyze soils, media for the exchange of matter; N, P, K fertilizer documents highlighting the impact of practices aimed at saving and preserving water in quantity and quality.
- Describe the role of the clay-humus complex.
- Know the role of nitrate, phosphate and potassium ions brought by fertilizers.
- Describe the functions of insecticides, fungicides and herbicides.
- Appropriate and analyze documents describing a good use of pesticides for a health impact and environmentally sustainable.
- Implement an experimental protocol to dose at using a color scale a species present in water or phytosanitary products.
- Appropriate documents and analysis in support of energy data the competition between the role of nutrient and the biofuel role of a cereal.