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|  **Overall Expectations** | **Specific Expectations** |
| A1. Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating) B3. Demonstrate an understanding of the structures and functions of biological molecules, and the biochemical reactions required to maintain normal cellular functionB2. Investigate the chemical structures, functions, and chemical properties of biological molecules involved in some common cellular processes and biochemical reactionsB1. Analyse technological applications of enzymes in some industrial processes, and evaluate technological advances in the field of cellular biology | A1.1 Formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research A1.2 Select appropriate instruments (e.g., sampling instruments, a microscope, a stethoscope, dissection instruments) and materials (e.g., dichotomous keys, computer simulations, plant cuttings), and identify appropriate methods, techniques, and procedures, for each inquiry A1.4 Apply knowledge and understanding of safe laboratory procedures when planning investigations by correctly interpreting Workplace Hazardous Materials Information System (WHMIS) symbols; by using appropriate techniques for handling and storing laboratory equipment and materials and disposing of laboratory and biological materials (e.g., preserved specimens); and by using appropriate personal protectionA1.12 Use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurements (e.g., SI units, imperial units) B3.2 Describe the structure of important biochemical compounds, including carbohydrates, proteins, lipids, and nucleic acids, and explain their function within cells B3.4 Describe the chemical structures and mechanisms of various enzymesB2.5 Plan and conduct an investigation related to a cellular process (e.g., factors that affect enzyme activity; factors that affect transport of substances across cell membranes), using appropriate laboratory equipment and techniques, and report the results in an appropriate format B1.1 Analyse technological applications related to enzyme activity in the food and pharmaceutical industries (e.g., the production of dairy products; bread-making; the use of enzymes to control reaction rates in pharmaceuticals)  |
| **Concepts** |
| **Terminology** | **Theory** |
| * pH
* Enzyme
* Temperature
* Coagulation
 | * Acid
* Base
* Macromolecule
* Protein
 | * Acids and bases
* Enzymes
* Denaturation factors for proteins
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| **Material to prepare** |
| Scenario* Copy of activity
* Copy of evaluation grid

Activity* Computer for research and planning protocol
* Material according to the type of evaluation suggested

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| Material | Perishable |
| Graduated pipette 0.5 and 1.0 mlDropperHot plate + beaker or heating bathThermometerTest tube or 20 ml test tubeStopwatchTest tube holderpH paper or pH meterFunnelCheesecloth or filter paperSpatula Graduated cylinder | Animal rennetVegetable rennetChymosin produced by fermentationLemon juiceAcetic acid 5% Sodium bicarbonate solution 5%10% creamWhole milk0% milkIceDistilled water Parafilm |

Pushing further* Computer for analysis and report
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| **Scenario*** Video, steps of cheese production: curdling, enzyme action
* Raw materials needed to make cheese
* Presentation of the work
* Research and selection of the variable to study
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| **Activity — part 1 — Planning*** Group the students.
* Divide the work tables according to the selected variables
* Students complete the laboratory protocol. [hypothesis, material and method]
* Approve the protocol before lab day

**Activity — part 2 — Experience*** Make sure the students follow the approved instructions
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| **Pushing further**Pool the results to determine the criteria to combine in order to achieve the best yieldConduct a verification laboratory to verify the choice of optimal coagulation factors |
| **Evaluation*** Summative: writing in the material and method section
* Summative: laboratory work — laboratory report
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| **Ressources*** Protocol example
* Equipment supplier

Internet * [Replacing chemical preservatives with functional biofilm with antiviral, antioxydant and bioreactive properties.](https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150)

 [[*https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150*](https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150)*]** [Biofilm](https://innovateurscanadiensenalimentation.ca/projet/a-la-recherche-d-une-solution-naturelle-contre-la-presence-d-agents-pathogenes-et-de-bacteries-de-contamination-dans-les-produits-de-volaille-et-de-legumes-surgeles)[<https://canadianfoodinnovators.ca/project/in-search-of-a-natural-solution-against-spoilage-bacteria-and-pathogens-in-poultry-and-frozen-vegetable-products>]
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