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| **Overall Expectations** | | **Specific Expectations** |
| A1. apply the scientific method to conduct laboratory and field experiments, research and problem solving  B2. investigate the structures and functions of cells, and the factors that influence cellular activity, using appropriate laboratory equipment and techniques;    B3. demonstrate an understanding of the basic processes of cellular biology | | A1.5 conduct a laboratory or field experiment, perform research, or apply a problem-solving strategy to answer a scientific question  A1.4 apply knowledge and understanding of safe laboratory practices and 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 protection  A1.5(...) using appropriate materials and equipment safely, accurately, and effectively, to collect observations and data  A1.8 synthesize, analyze, interpret, and evaluate qualitative and/or quantitative data  B1.3 explain the fundamental role of enzymes in biochemical reactions  B2.3 verify the effect of the environment on the enzymatic activity |
| **Concepts** | | |
| **Terminology** | | **Theory** |
| * pH * Enzyme * Temperature * Coagulation | * Acid * Base * Macromolecule * Protein | * Acids and bases * Enzymes * Denaturation factors for proteins |
| **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  |  |  | | --- | --- | | Material | Perishable | | Graduated pipette 0.5 and 1.0 ml  Dropper  Hot plate + beaker or heating bath  Thermometer  Test tube or 20 ml test tube  Stopwatch  Test tube holder  pH paper or pH meter  Funnel  Cheesecloth or filter paper  Spatula  Graduated cylinder | Animal rennet  Vegetable rennet  Chymosin produced by fermentation  Lemon juice  Acetic acid 5%  Sodium bicarbonate solution 5%  10% cream  Whole milk  0% milk  Ice  Distilled water  Parafilm |   Pushing further   * Computer for analysis and report | | |
| **Activity** | | |
| **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 | | |
| **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 | | |
| **Pushing further**  Pool the results to determine the criteria to combine in order to achieve the best yield  Conduct 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 | | |
| **Ressources**   * Protocol example * Equipment supplier   Internet   * [Replacing chemical preservatives with functional biofilm with antiviral, antioxidant 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>] | | |