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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)  F2. Investigate chemical reactions, using appropriate techniques of quantitative analysis | | 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 and materials, and identify appropriate methods, techniques, and procedures, for each inquiry  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; and by using appropriate personal protection  A1.8 Synthesize, analyse, interpret, and evaluate qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis and whether it is consistent with scientific theory; identify sources of bias and/or error; and suggest improvements to the inquiry to reduce the likelihood of error  A1.12 Use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurements  A1.11 Communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats  F2.2 Write balanced chemical equations to represent the chemical reactions involved in neutralization of acids and bases  F2.4 Conduct an inquiry, using available technology or chemical tests, to detect the presence of inorganic substances in various samples of water  F2.3 Conduct an acid-base titration to determine the concentration of an acid or a base |
| **Concepts** | | |
| **Terminology** | | **Theory** |
| * pH * Titration * Température * Coagulation | * Acid * Base * Organic molecule | * pH * Strength and concentration acid and base |
| **Material to prepare** | | |
| Context   * Copy of activity * Copy of assessment grid   Activity   * Computer for research and planning * Material according to the types of evaluation offered  |  |  | | --- | --- | | Material | Perishable | | – 25 mL burette  – Burette holder  – Universal holder  – 50 mL, 25 mL or 10 mL volumetric pipette and a sampling device  – Magnetic stirrer and its magnetic bar.  – Graduated cylinder  – 4 erlenmeyers  – Beaker labelled “waste” | – Phenolphthalein (1% solution in 95% ethanol)  – 40 mL fresh milk, 40 mL aged milk  – Sodium hydroxide solution 0,05 mol/L  – Distilled water |   **Pushing further**   * Molecular models * Computer for analysis and reports | | |
| **Activity** | | |
| **Context**   * Video, the steps of cheese production: curdling enzyme action * Raw materials to make cheese * Presentation of assignment | | |
| **Activity**   * Group the students * Complete the lab **(document\_fresh milk for good cheese)** | | |
| **Pushing further**   * Using molecular models, construct the two enantiomers of the lactic acid molecule. * Redo a titration by changing the number of drops of phenolphthalein (2 drops, 5 drops). Is this number of drops sufficient to spot the change in coloration? * Make predictions about the Dornic degree of yogurt and fresh cheese. Have the students write a protocol and experiment to verify their predictions. * Carry out the same dosage but with a pH meter. | | |
| **Assessment**   * Summative: writing the material and method section * Summative: lab work — lab report | | |
| **Resources**   * **Material supplier** * The raw formula of lactic acid: C3H6O3 ; pKa = 3,8 * Ionic product of water at 20 °C : Ke = 10-14 * Molar masses: C : 12g/mol; O : 16 g/mol; H : 1g/mol * Scale of milk freshness   **Internet**   * [Déterminer le degré Dornic](https://portail.stpaul4.ac-reunion.fr/wordpress/cgenial/2015/10/31/determination-du-degre-dornic-dun-yaourt-a-boire/?ticket=)  *[*[*https://portail.stpaul4.ac-reunion.fr/wordpress/cgenial/2015/10/31/determination-du-degre-dornic-dun-yaourt-a-boire/?ticket=*](https://portail.stpaul4.ac-reunion.fr/wordpress/cgenial/2015/10/31/determination-du-degre-dornic-dun-yaourt-a-boire/?ticket=) * [Détermination de l’acidité du lait](http://lplagrangemaths.free.fr/Sciences/cours/Bac_Pro/HS/HS5/HS51_TP_N%B02_Acidite_d_un_lait.pdf)  *[*[*http://lplagrangemaths.free.fr/Sciences/cours/Bac\_Pro/HS/HS5/HS51\_TP\_N%B02\_Acidite\_d\_un\_lait.pdf*](http://lplagrangemaths.free.fr/Sciences/cours/Bac_Pro/HS/HS5/HS51_TP_N%B02_Acidite_d_un_lait.pdf)*]* * [Le lait manipulation](https://www2.ulb.ac.be/sciences/cudec/LaitManip2.html)  *[*[*https://www2.ulb.ac.be/sciences/cudec/LaitManip2.html*](https://www2.ulb.ac.be/sciences/cudec/LaitManip2.html)*]* * [Du lait au yogourt](http://physiquechimie-ea.ensfea.fr/wp-content/uploads/sites/10/2018/05/p22-47-projet-lait-BTS-PA-papier.pdf) *[*[*http://physiquechimie-ea.ensfea.fr/wp-content/uploads/sites/10/2018/05/p22-47-projet-lait-BTS-PA-papier.pdf*](http://physiquechimie-ea.ensfea.fr/wp-content/uploads/sites/10/2018/05/p22-47-projet-lait-BTS-PA-papier.pdf)*]* | | |