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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)            E2. Investigate qualitative and quantitative properties of solutions, and solve related problems | | A1.1 Formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulated 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  A1.8 Synthesize, analyse, interpret, and evaluate quantitative and/or qualitative data; solve problems involving quantitative data; 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 error; and suggest improvements to the inquiry to reduce the likelihood of error  A1.12 Use appropriate numeric, symbolic, and graphic modes of representation (e.g., biological diagrams, Punnett squares), and appropriate units of measurements (e.g., SI and imperial units)  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 (e.g., data tables, laboratory reports, presentations, debates, simulations, models)    E2.2 Solve problems related to the concentration of solutions by performing calculations involving moles, and express the results in various units  E2.7 Determine the concentration of an acid or a base in a solution using the acid-base technique |
| **Concepts** | | |
| **Terminology** | | **Theory** |
| pH  Titration  Temperature  Coagulation | Acid  Base  Organic molecule | pH  titration  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   |  |  | | --- | --- | | Equipment | Perishable | | – 25 mL burette  – Burette holder  – Universal holder  –  25 mL volumetric pipette and a sampling device  –  Magnetic stirrer and its magnetic bar  – 2 beakers or Erlenmeyer flasks  – Beaker labelled “waste” | – Phenolphthalein (1% solution in 95% ethanol)  – Bromothymol blue  – 20 mL fresh milk  – 20 mL fresh cheese or plain yogurt  – Sodium hydroxide solution 0.05 mol/L  – Sodium hydroxide solution 0.25 mol/L  – Distilled water  – Graduated cylinder. |   **Material to push further**  Molecular models  Computer for analysis and reports | | | |
| **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 **(see document\_acid dosage)** | | |
| **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   **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.pd*](http://physiquechimie-ea.ensfea.fr/wp-content/uploads/sites/10/2018/05/p22-47-projet-lait-BTS-PA-papier.pdf)*]* | | |