C.1 Template: Contextualized Learning Activities (CLAs)[1]

For the "other required credits" in the bundle of credits, students in an SHSM program must complete learning activities that are contextualized to the knowledge and skills relevant to the economic sector of the SHSM. CLAs, a minimum of six hours and a maximum of ten hours in length, address curriculum expectations in these courses in the context of the sector.

This template must be used to develop a CLA that will be submitted to the ministry. CLAs are posted on the Ontario Educational Resource Bank (OERB) website at http://resources.elearningontario.ca as well as on the SHSM e-Community website, a password-protected site for educators, at http://community.elearningontario.ca

Prior to writing a CLA all teachers should have familiarized themselves with the

CLA How-to Write Guide

In order for a CLA to be posted, it is important to:

- submit all material in a **single** Microsoft Word file (not as a PDF) **please note, no attachments will be accepted (exception: PowerPoint presentations that accompany a CLA)**
- observe all copyright regulations (see Access *Copyright – The Canadian Copyright Licensing Agency* at www.accesscopyright.ca).
- Complete **all** sections of the template including:
    - 4 Key Search Words – these should allow others to search and locate this CLA from an electronic database. You do not need to include the course code and the SHSM sector as key words, as those will be default key words.

e.g. *Key Search Words*	geometry, manufacturing, conversions, calculations

    - Differentiated Instruction portion of the template
- When saving the CLA, please use the following document naming format:

  Sector-Course Code–Title (max 250 characters for entire title)

  Ex. H&T–SCH3U–Mole Cookie Lab.doc

Note to CLA Developers: For your convenience, instructions (enclosed in square brackets) have been provided throughout this template. Remove these instructions when you complete the template.

[1] Revised June 2011

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Development date	August 2011
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SHSM sector	Health and Wellness
Course code and course title	SCH3U- Chemistry Grade 11- University Preparation
Name of CLA	The Pharmaceutical Industry: Science and Ethics.
Brief description of CLA	In this CLA the students will perform titration analysis to determine the ASA content of an over-the-counter aspirin and compare the result with the quantity stated on the product label. Students will then explore a career in the field of pharmaceuticals through a guest speaker presentation and then analyze a case study and reflect on the ethics of the pharmacology involved.
Key Search Terms (Do not use SHSM, CLA, Course Code or Sector)	Titration; Stoichiometry; Pharmaceutical ethics;
Duration	Approximately 7, 76-minute periods (or 9 hours)
Overall expectations	Scientific Investigation Skills and Career Exploration A2. Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields. Quantities in Chemical Reactions D1. analyze processes in the home, the workplace and the environmental sector that use chemical quantities and calculations, and assess the importance of quantitative accuracy in industrial chemical processes; D2. investigate quantitative relationships in chemical reactions, and solve related problems;

Specific expectations	A1. Scientific Investigation Skills Initiating and Planning A1.2 select appropriate instruments (e.g., a balance, glassware, titration instruments) and materials (e.g., molecular model kits, solutions), 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 using appropriate techniques for handling and storing laboratory equipment and materials and disposing of laboratory materials; and by using appropriate personal protection (e.g., wearing safety goggles) Performing and Recording A1.5 conduct inquiries, controlling relevant variables, adapting or extending procedures as required, and using appropriate materials and equipment safely, accurately, and effectively, to collect observations and data A1.6 compile accurate data from laboratory and other sources, and organize and record the data, using appropriate formats, including tables, flow charts, graphs, and/or diagrams Analyzing and Interpreting A1.8 synthesize, analyze, interpret, and evaluate qualitative and quantitative 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 A1.10 draw conclusions based on inquiry results and research findings, and justify their conclusions with reference to scientific knowledge Communicating 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) A1.12 use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurement (e.g., SI and imperial units) A1.13 express the results of any calculations involving data accurately and precisely, to the appropriate number of decimal places or significant figures A2. Career Exploration A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., pharmacist, forensic scientist, chemical engineer, food scientist, environmental chemist, occupational health and safety officer, water quality analyst, atmospheric scientist) and the education and training necessary for these careers D1. Relating Science to Technology, Society and the Environment D1.1 analyze processes in the home, the workplace, and the environmental sector that involve the use of chemical quantities and calculations D2. Developing Skills of Investigation and Communication D2.1 use appropriate terminology related to quantities in chemical reactions, including, but not limited to: stoichiometry, percentage yield, limiting reagent, mole and atomic mass D2.5 calculate the corresponding mass, or quantity in moles or molecules, for any given reactant or product in a balanced chemical equation as well as for any other reactant or product in the chemical reaction

Catholic graduate expectations (if applicable)	CGE1d -develops attitudes and values founded on Catholic social teaching and acts to promote social responsibility, human solidarity and the common good; CGE2b -reads, understands and uses written materials effectively; CGE2c -presents information and ideas clearly and honestly and with sensitivity to others; CGE3b -creates, adapts, evaluates new ideas in light of the common good; CGE3c -thinks reflectively and creatively to evaluate situations and solve problems; CGE3d -makes decisions in light of gospel values with an informed moral conscience; CGE5g -achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others; CGE7d -promotes the sacredness of life; CGE7e -witnesses Catholic social teaching by promoting equality, democracy, and solidarity for a just, peaceful and compassionate society; CGE7j -contributes to the common good
Essential Skills and work habits	Essential Skills ☒Reading Text ☒Writing ☒Document Use ☒Computer Use ☒Oral Communication Numeracy ❑ Money Math ❑ Scheduling or Budgeting and Accounting ☒Measurement and Calculation ☒Data Analysis ❑ Numerical Estimation Thinking Skills ☒Job Task Planning and Organizing ☒Decision Making ☒Problem Solving ❑ Finding Information Work Habits ☒Working Safely ☒Teamwork ☒Reliability ☒Organization ☒Working Independently ☒Initiative ❑ Self-advocacy ❑ Customer Service ❑ Entrepreneurship

Instructional/Assessment Strategies

Teacher's notes

This activity has been designed for Grade 11 University Chemistry students who are currently enrolled in the Health & Wellness Specialist High Skills Major program. Students should have already learned acid-base theories as well as molar concentration calculations and have a clear understanding of significant figures. It is expected that students will require 7 classes to complete all components of this activity, however up to 10 hours is allowed to complete a CLA.
Students will work both independently and as part of a team in preparing their Lab Report. Students will then work collaboratively to examine the ethical issues surrounding the pharmaceutical industry and draw their own individual conclusions. The components of this activity provide several different opportunities for assessment. Once completed, the lab activity and the ethical reflection paragraph will be submitted to the teacher for assessment. All rubrics have been included in the Appendices of this document as noted below.

Teachers will require a regular classroom for days 1, 3, 6 and 7.
Teachers need a science lab for days 2, 4 and 5.

Context

This learning unit is contextualized specifically for students in the Health and Wellness sector. Students will demonstrate the skills related to the analysis of aspirin lab (titration and stoichiometry). Using this activity as an introduction to pharmacology, students should have the opportunity to hear a speaker from the pharmaceutical profession (pharmacist, pharmacy technician, pharmaceutical representative, pharmaceutical chemist). The subsequent activity to this speaker explores the ethical questions related to the field of pharmacology and the pharmaceutical profession.

Strategies

Day 1 - Classroom

Teacher directed review of the terms and calculations need for the titrations in the CLA

Review includes:

- completing worksheet on terminology related to acid and bases (see Appendix A)
- working through Example titration problems (Examples can be found on pg 395 and 397 in Nelson Chemistry 11).
- answering assigned practice questions pg 399 #3, 4, 5, 6, 8 Nelson Chemistry 11.

Day 2 – Science Lab

Show power point presentation on performing a manual titration. (Appendix B)

Show video on titration: http://www.youtube.com/watch?V=YD22McrdyB4

Students complete Titration Analysis of Vinegar (Appendix C)

Day 3 – Classroom

Compare volume readings of $NaOH_{(aq)}$ and molar concentration of acetic acid values from previous day's Titration Analysis of Vinegar. Discuss sources of error.

Take up homework problems assigned on Day 1 to ensure understanding of concepts and calculations involved in a titration.

Discuss Food and Drug Administration (FDA) regulations of labeling over-the-counter (OTC) medicines. (Appendix D)

Discuss Aspirin, its chemical name, uses, side effects. (Appendix D)

Discuss the process of Aspirin Titration and its uses. (Appendix D)

Introduce the lab for tomorrow: "Is the concentration of ASA on the package correct?"

Day 4/5 – Science Lab

Students complete Analysis of ASA Titration Lab - "Is the concentration of ASA on the package correct?" (Appendix E)

Day 6 – Classroom

Presentation by Guest Speaker: pharmacist, pharmacy technician, pharmaceutical representative, pharmaceutical chemist (Appendix F)

Day 7 – Classroom

Teacher directed discussion on the ethics of the pharmaceutical industry (See Appendix G)

Students break into small groups to explore issues in more depth. (See Appendix H)

Ideas are recorded and posted in classroom.

Students complete Reflection activity (See Appendix I for Rubric)

Modes of Learning:

Teacher-directed instruction & demonstration
Individual reading and reflection
Guided group investigation & inquiry

For students who are not progressing:

- Provide approximate values for titration in order to give the students a sense of where the endpoint will be.
- Fill in the blank worksheet for titration calculations.
- Provide concept map for students to guide their inquiry and group discussions.

Assessment and Evaluation of Student Achievement

How will we know students are learning?	How will we know students have learned?
• How will students demonstrate progress towards the desired learning? By Answering Questions.	• How will students demonstrate achievement of the desired learning? Through their lab report and a reflective paragraph.
• What criteria will be used to determine whether students are learning? Thumbs up/thumbs down, homework check	• What criteria will be used to determine that students have learned? As specified in attached Rubrics
• What assessment strategies/tools will best gather evidence during learning? Observation and Facilitation of Discussions	• What assessment strategies/tools will best gather evidence that students have learned? As specified in attached Rubrics

Strategies/Tasks	Purpose
1. Completing Review Worksheet	Assessment for learning of knowledge
2. Reading text and Answering Questions	Assessment as learning of knowledge
3. Collaborative Lab Activity (Vinegar titration)	Assessment as learning of student understanding of the inquiry
4. Completing Packaging Activity	Assessment for learning of understanding of concepts
5. Collaborative Lab Report (ASA Titration)	Assessment of learning of collaboration, practical skills and ability to make connections
6. Reflection paragraph	Assessment of knowledge, inquiry, communication and application skills

Assessment tools

Written Review, Skills Demonstrations, Rubrics, Essential Skills and Work Habits

See attached files
Appendix E
Appendix I

Differentiation

Differentiation will be based on:

Readiness ☐ Learner Profile ■ Interest ■

Differentiation will take place through:

Content ■ Process ■ Product ■ Learning Environment ☐

Additional Notes/Comments/Explanations

This CLA is designed so that teachers can use it with their entire chemistry class (SHSM and non SHSM students) as it covers many specific expectations for SCH3U.

If time is an issue, teachers could choose to assign the ethical case study portion of the CLA only to the SHSM students.

Resources

Authentic workplace materials

Lab equipment manuals

MSDS for chemicals used

Human resources

Guest Speaker: Pharmacist, Pharmacy tech, Pharmaceutical representative, Pharmaceutical chemist

Print resources

Chemistry 11, Nelson, 2002. pp. 394 – 407

Chemistry 11, McGraw-Hill Ryerson, 2001. pp. 394 - 404

Video resources

http://www.youtube.com/watch?V=YD22McrdyB4

Software

Websites

http://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?id=40112

http://html.rincondelvago.com/aspirin_1.html

www.bus-edpartnership.org

http://www.globalissues.org/article/52/pharmaceutical-corporations-and-medical-research#Testingonhumanswithoutpermission

http://scidiv.bellevuecollege.edu/Chemistry/Chem161/Chem161labs/Apirin%20titration.pdf

http://www.studycove.co.uk/study/aspirin-titration

http://docs.google.com/viewer?a=v&q=cache:ZXZOBHilQlgJ:https://ims.sd36.bc.ca/schools/NorthSurreySecondary/Departments/Science/Powerpoints/Chemistry%252012/titration%2520demo.ppt+titration+powerpoint&hl=en&gl=ca&pid=bl&srcid=ADGEESjrwaf_o7ZfIoTI2Ec5MX4nOMzh8NMADP0n-odXkADStvGor0iPqhjsjDeIe5IUwEE0IVNhHzwPNhu7EHtU0HLIYNh2g0S626Sfln-DFkaWGY_ZNsowesOF69Hz0YkZ4_izfxGI&sig=AHIEtbSdzzYmtmhpEWoPRToQG9nPYgUK0A

Other resources

Accommodations

- provide computer access for students requiring literacy support, eg. Kurzweil
- additional time may be needed for assessment for and of learning
- font can be increased for students that have vision problems
- provide video resources & guided feedback sheet with questions related to the videos
- provide fill-in-the-blank lab report template
- provide data for analysis
- create a visual representation for their reflection

List of Attachments

Appendix A - Student Worksheet
Appendix A - Teacher Copy of Worksheet
Appendix B - Power Point Presentation on Titration
Appendix C – Titration Analysis of Vinegar
Appendix D – Labeling Activity
Appendix D – Teacher Copy of Labeling Activity
Appendix E – Titration Analysis of ASA
Appendix F – Teacher Outline for Guest Speaker
Appendix G – Pharmaceutical Ethics Article for Class Discussion
Appendix G – Teacher Copy of Ethics Discussion Questions
Appendix H – Small Group Case Studies
Appendix I – Rubric for Reflection