CHEMICAL – TECHNICIAN (CHTN 2021)

Preamble

The Canadian Technology Standards (CTS) are a collection of learning outcomes for Canada's engineering technology and applied science profession at the technician and technologist level.

Stakeholders

The CTS may be utilized by accreditation bodies, provincial professional associations, educational institutions, government agencies, industry and others for the purposes accreditation, certification and other applications.

Educational Programs

The Chemical CTS is relevant to programs including, but not limited to, chemical technician, biotechnician, environmental, waste management, corrosion, and food at the at the technician level.

Learning Outcomes

This CTS list Discipline Learning Outcomes (DLO) which describe the significant and essential learning that students have achieved and can reliably demonstrate at the time of graduation. Each DLO has a number of Learning Outcome Indicators (LOI), which are examples illustrating, defining and clarifying the level of performance expected. The list of LOI is not comprehensive and there may be other indicators which can be used to assess achievement of learning outcomes.

DLO and their LOI employ only cognitive domain verbs selected from a table of cognitive verbs modeled after a Bloom's cognitive domain table of verbs adapted specifically for engineering technology and applied science disciplines.

Graduate Capability

Students graduating from an accredited program have demonstrated achievement of all general learning outcomes, including a prescribed level of math, and discipline learning outcomes selected by the program.

Having completed a program that is based on applied mathematics and scientific and engineering theory, principles and practices and having acquired the knowledge, skills and attitudes to function in the work place, graduates are;

- able to evaluate assignments, establish objectives, set parameters and determine appropriate procedures and actions.
- able to exercise due diligence in the workplace and adhere to related practices, applicable laws and health and safety practices.
- able to work in accordance with labor-management principles and practices.
- able to work independently or interdependently as part of a discipline or multi-disciplinary team.
- prepared to assume responsibility for their work.

Graduate Career Opportunities

Graduates of Chemical Engineering Technology - Technician programs have career opportunities in such areas as: business, industry, construction, government, and public organizations. They may find employment in careers such as: maintenance of equipment, processes, infrastructure, or systems; preparation of specifications, drawings, or instructions; quality operations; operations and maintenance; field and customer service; estimating; technical sales; supervision of projects; training activities; and many other areas.

Discipline Learning Outcomes (DLOs)

CHTN01 Qualitative Analysis

- Apply basic mathematical, physical, and chemical concepts to performance of assigned tasks.

Learning Outcome Indicators include:

1.1 Perform analyses using mathematical skills, such as algebraic equations, functions, factors, ratios, conversions, and linear regressions.
1.2 Apply knowledge of principles of physics such as heat, sound, light, electricity, and mechanics.
1.3 Apply knowledge of principles of general chemistry such as nomenclature, acid/base theory, stoichiometric calculations, and redox reactions.
1.4 Apply knowledge of organic, inorganic, analytical, and physical chemistry to applicable tasks.

CHTN02 Quantitative Analyses

- Conduct basic manual and instrumental quantitative analyses and tests accurately using prescribed laboratory procedures.

Learning Outcome Indicators include:

2.1 Analyse, collect, and prepare samples using prescribed techniques.
2.2 Perform laboratory operations using standard laboratory equipment.
2.3 Prepare solutions and dilutions using appropriate concentration units and conversions.
2.4 Report quantitative and qualitative results in the required format.
2.5 Perform physical testing on chemicals and materials.
2.6 Use time, equipment, and materials in a cost-effective manner.
2.7 Perform procedural calculations.
2.8 Use spectrometric, electrometric, and chromatographic instrumental techniques and their associated data reduction systems.
2.9 Perform basic calculations related to instrumental analysis.
2.10 Recognize unexpected results according to specified guidelines.
2.11 Use computer/instrument interface.
2.12 Contribute to routine maintenance and troubleshooting of instruments.

CHTN03 Synthetic and Purification

- Prepare organic and inorganic compounds using standard synthetic and purification procedures.

Learning Outcome Indicators include:

3.1 Implement established synthetic procedures.

3.2 Use standard separation and purification methods such as distillation, crystallization, preparatory chromatography, and extraction.
3.3 Validate purity and identity of product(s) using established/stated procedures.

3.4 Calculate yield of process.

CHTN04 Report Results

- Report results of analyses and tests using routine statistical calculations.

Learning Outcome Indicators include:

4.1 Calculate mean, median, mode, standard deviation, and coefficient of variation.
4.2 Perform comparative analysis statistical tests.
4.3 Use stipulated calibration and statistical calculations to meet quality assurance and quality control requirements and criteria.

CHTN05 Quality Control

- Perform Quality Control procedures.

Learning Outcome Indicators include:

5.1 Construct and use quality control charts.
5.2 Recommend referrals according to established criteria.

CHTN06 Computer Applications

- Apply computer skills relevant to the chemical engineering technology field.

Learning Outcome Indicators include:

6.1 Utilize current software packages such as word processing, spreadsheets, and databases to express and manipulate chemical engineering technology information.
6.2 Monitor computers associated with laboratory automation.
6.3 Use software to acquire, store, retrieve, process, and present information.
6.4 Apply process control software.

CHTN07 Industrial Chemical Systems

- Collaborate in the application of design principles to industrial chemical systems.

Learning Outcome Indicators include:

7.1 Perform mass and energy balances.
7.2 Collaborate in the selection of equipment for common unit operations including equilibrium contacting, evaporation, heat transfer, phase separation, and chemical reactors.

7.3 Collaborate in the selection of equipment for liquid and solids handling including pumps, valves, and pipes.
7.4 Collaborate in the selection of process control equipment.

CHTN08 Industrial Chemical Processes

- Collaborate in the analysis of operation of industrial chemical processes.

Learning Outcome Indicators include:

8.1 Access operational data such as sampling and maintenance records.
8.2 Analyze operational data.
8.3 Collaborate in diagnosing operational processes such as distillation columns, heat exchangers, and filter presses.

CHTN09 Operations

- Operate chemical processes.

Learning Outcome Indicators include:

9.1 Operate start up chemical process equipment.
9.2 Operate chemical process equipment safely and efficiently.
9.3 Manage shut down of chemical process equipment.

CHTN10 Communication

- Demonstrate good interpersonal and communication skills working in chemical engineering technology environment.

Learning Outcome Indicators include:

10.1 Demonstrate ability to work well in team environment.
10.2 Respond appropriately to feedback from supervisors.
10.3 Communicate with others in oral and written formats.
10.4 Access, collect, and use information from appropriate chemical and related literature.
10.5 Compile, organize, prepare, and present scientific and technical data and results.

CHTN11 Environmental Laws and Regulations

- Recognize and explain the importance of: relevant occupational health, safety, environmental law, legislation, and regulations; established policies and procedures; and ethical principles.

Learning Outcome Indicators include:

11.1 Apply specific industrial good manufacturing and laboratory practices.

11.2 Recognize and apply environmental, health, and safety legislation, and related regulations such as the Workplace Hazardous Materials Information System (WHMIS) and the Occupational Health and Safety Acts.
11.3 Perform all procedures in accordance with established workplace safety protocols.
11.4 Recognize the influence that chemical engineering technology has on society in

terms of environment, health, and safety.