



GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of Education

Evaluation, Testing, and Certification Division

Chemistry 3202 Provincial Examination

Summative Evaluation

Summative evaluation is directed toward a general assessment of the degree to which outcomes are attained over the reporting period of a course and is used to grade, certify or select students. It is not intended to improve current instruction for the benefit of those being evaluated. It measures what has happened, not what is happening. Results of summative evaluations can serve to indicate areas of strength and needs, and these results can be used to influence later instruction. In that sense, summative evaluation can be used to improve teaching and learning in subsequent reporting periods or years.

Science Provincial Examinations

The Department of Education of Newfoundland and Labrador administers a provincial summative examination for Chemistry 3202 at the end of each school year. This examination is worth 50% of the student's total mark. It evaluates the cognitive domain of the course by testing the curriculum outcomes at different levels of cognitive learning and at the appropriate depth and breadth required as outlined in the curriculum guide.

Provincial examinations in Newfoundland and Labrador are created by teachers in consultation with Test Development Specialists at the Department of Education. Teachers, from across the province, are involved in all levels of the exam development process. These include item writing, exam creation, field testing, validation of items, and marking.

Evaluating Higher Order

By its very nature, chemistry is based on a problem solving philosophy and students tend to spend more time applying theories and concepts than in other sciences. It lends itself, therefore, to assessing at higher levels of Bloom's taxonomy. Teachers should be diligent in ensuring that assessment items requiring higher order levels are included in their evaluation instruments throughout the school year. The provincial examination in Chemistry 3202 is constructed using a broad range of Bloom's taxonomy.

The cognitive level of evaluation items does not require students to have a greater knowledge than indicated by the outcomes. Most outcomes can be evaluated at all cognitive levels. For the purpose of constructing provincial examinations, the Department of Education of Newfoundland and Labrador has summarized Bloom's six categories of competence into three levels of cognitive learning. These levels are outlined below.

Level 1

The student demonstrates attainment of outcomes through the ability to recall learned materials and to grasp the meaning of material. It can range from the recall of simple facts to translating material from one form to another. It represents the lowest level of learning and understanding of outcomes.

For example,

What happens when a catalyst is added to a reaction?

- (A) heat of reaction decreases
- (B) heat of reaction increases
- (C) rate of reaction decreases
- (D) rate of reaction increases

Level 2

The student demonstrates attainment of outcomes through the ability to apply rules, concepts, principles, laws, or theories.

For example,

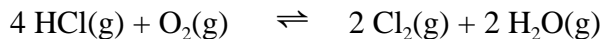
- (i) What is the oxidation number of manganese in MnO_2 ?
 - (A) 0
 - (B) + 2
 - (C) + 4
 - (D) + 6
- (ii) A stainless steel spoon is put into an electrolytic cell that has 3.10 A of electricity passing through it for 2.50 h. What mass of silver will be produced?

Level 3

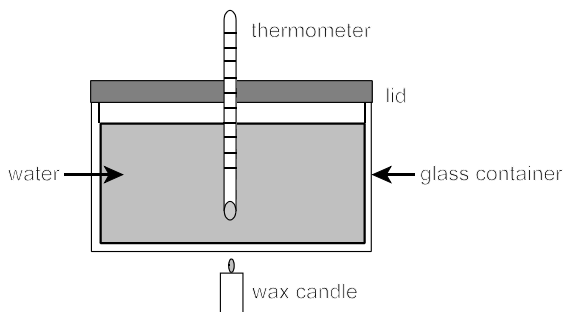
The student demonstrates attainment of outcomes through the ability to use learned materials in new situations, the ability to break material down into its component parts so that its organizational structure may be understood, the ability of putting parts together to form a new whole, or the ability to judge the value of a piece of information.

For example,

- (i) Equal numbers of moles of HCl and O₂ in a closed system are allowed to reach equilibrium as represented by the equation below. What must be true at equilibrium?



- (A) [HCl] must be greater than [Cl₂].
(B) [HCl] must be less than [Cl₂].
(C) [HCl] must be greater than [O₂].
(D) [HCl] must be less than [O₂].
- (ii) The molar enthalpy of combustion of candle wax, C₂₅H₅₂(s), was determined in an experiment using the apparatus shown in the diagram below.



The following two quantities were measured:

- mass of water in glass container = 200 g
- initial temperature of water = 25.4°C

- (A) State two other quantities that would also have to be measured in order to determine the molar enthalpy of combustion of the candle wax.
- (B) Suggest one improvement that could be made to the experimental apparatus, and briefly state how this would help to increase the accuracy of the result.

Chemistry 3202 Provincial Examination

Format

The provincial examination in Chemistry 3202 is composed of two parts. Part I contains 50 multiple choice questions that measure student's achievement at all levels of cognitive learning. Part II contains constructed response questions that measure student's achievement only at the higher levels of cognitive learning (level 2 and 3). Part I has a value of 50% and part II has a value of 50%. Students are required to answer all questions on the examination. To ensure highest marks possible, their responses to part II questions must be clearly presented in a well-organized manner with proper use of units, formulae and significant figures where appropriate.

Table of Specifications

A table of specifications is created by teachers and is reviewed annually during provincial examination development. It guides the construction of each provincial examination and covers all parts of the examination. It assigns the mark value to each unit and each cognitive level. The total percentage for each unit directly corresponds to the suggested time lines for teaching each unit.

Chemistry 3202 Table of Specifications

Unit	Cognitive Level %			TOTAL %
	1	2	3	
Equilibrium	5	15	5	25
Acids & Bases	6	18	6	30
Thermochemistry	5	15	5	25
Electrochemistry	4	12	4	20
TOTAL %	20	60	20	100%

The evaluation instrument will contain 15-20% of core lab and STSE (Science, Technology, Society, and the Environment) content.