

DEFINITION OF THE EVALUATION DOMAIN

ADULT GENERAL EDUCATION (AGE)

DIVERSIFIED BASIC EDUCATION PROGRAM (DBE)

SCIENCE AND TECHNOLOGY

The Energy Challenge

TSC-4061-2

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Coordination and content

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Table of Contents

Introduction	1
Explanations Regarding the Examination	2
Subject-Specific Competencies.....	2
Categories of Knowledge	2
Evaluation Criteria.....	3
Proficiency in Subject-Specific Knowledge	4
Weighting	4
Specifications for the Evaluation Instruments	5
Examination: Number of Parts, Procedure and Duration.....	5
Authorized Materials.....	6
Examination Content.....	6
Information-Gathering Tools	7
Assessment Tools	7
Pass Mark	8
Retakes	8
Appendix I – Reference Document.....	9
List of Formulas and Constants	9
List of Standard Electrical Symbols	10
Periodic Table of the Elements	11

Introduction

The Definition of the Evaluation Domain (DED) ensures consistency between a course and the related evaluation instruments. The DED is used to select, organize and describe the essential and representative elements of a course. The DED is based on the program of study and the course, but should by no means replace them in the planning of instructional activities.

All the DEDs produced after June 30, 2014, by the Ministère de l'Éducation (Ministère) are prescriptive. Consequently, they are the reference documents to be used in the development of all examinations, be they ministerial examinations or those developed by adult education centres or by Société GRICS (BIM). The DEDs thus serve as a model for preparing multiple equivalent versions of examinations that are valid across the province.¹

Since the development of evaluation instruments for the TSC-4061-2 course is the responsibility of the Ministère, the ministerial examination must be administered and marked in accordance with the *Instructions for Administering the Examination* and the *Marking Guide*.

At no time may the ministerial and prototype examinations produced by the Ministère be used as evaluations to support learning or as classroom practice exercises.

Furthermore, as set out in the *Policy on the Evaluation of Learning*, adult learners must know what they will be evaluated on and what is expected of them.² The DEDs are recommended for this purpose.

1. Québec, Ministère de l'Éducation du Québec, *Policy on the Evaluation of Learning* (Québec: Gouvernement du Québec, 2003), 47.

2. Ibid., 9.

Explanations Regarding the Examination

The content of the examination for the course The Energy Challenge, TSC-4061-2, matches the elements of the Science and Technology program. All subject-specific competencies as well as general concepts and techniques are covered in the examination.

Subject-Specific Competencies

1. Seeks answers or solutions to scientific or technological problems
2. Makes the most of [their] knowledge of science and technology
3. Communicates in the languages used in science and technology

Categories of Knowledge

The knowledge covered in the Science and Technology program includes both general concepts and techniques used in workshops and laboratories.

Table 1: List of general concepts and techniques used in Science and Technology

General Concepts	Techniques
▪ Graphical language ▪ Electrical engineering ▪ Organization of matter ▪ Electricity ▪ Electromagnetism ▪ Transformation of energy ▪ Lithosphere ▪ Hydrosphere ▪ Atmosphere ▪ Space	▪ Experimentation ▪ Graphical language ▪ Manufacturing ▪ Measurement

Evaluation Criteria

The three subject-specific competencies are evaluated using the same evaluation criteria as those in the Science and Technology program. Competency 3 is evaluated at the same time as the other two subject-specific competencies.

Information Clarifying the Evaluation Criteria for Competencies 1 and 3 (Practical Part)

Appropriate representation of the situation

This criterion is used to evaluate the adult learner's ability to:

- determine the need that the electrical circuit meets
- determine the characteristics or constraints related to the design of an electrical circuit
- comply with scientific and technological terminology, standards and conventions

Development of a suitable plan of action

This criterion is used to evaluate the adult learner's ability to:

- select the resources (e.g. materials, equipment, tools, quantities) that enable them to design the electrical circuit
- design and draw a diagram of the electrical circuit
- comply with scientific and technological terminology, standards and conventions

Appropriate implementation of the plan of action

This criterion is used to evaluate the adult learner's ability to:

- carry out the necessary assembly techniques
- carry out the necessary measurement techniques
- gather data and use the appropriate types of representation
- work safely

Development of relevant explanations, solutions or conclusions

This criterion is used to evaluate the adult learner's ability to:

- demonstrate, through explanations and experimentation, that the prototype complies with the specifications
- propose changes to the electrical circuit
- provide clear answers that comply with scientific and technological terminology, standards and conventions

Information Clarifying the Evaluation Criteria for Competencies 2 and 3 (Theory Part)

Appropriate interpretation of the issue

This criterion is used to evaluate the adult learner's ability to:

- make connections between the relevant information in the situation and the scientific and technological concepts needed to deal with the situation.

Relevant use of scientific and technological knowledge

This criterion is used to evaluate the adult learner's ability to:

- describe compulsory concepts associated with the general concepts of the course
- explain issues and/or technological applications associated with the general concepts of the course
- justify choices related to issues and/or technological applications associated with the general concepts of the course
- represent, using different means (e.g. symbols, drawings, equations), compulsory concepts, issues and/or technological applications associated with the general concepts of the course

Appropriate formulation of explanations or solutions

This criterion is used to evaluate the adult learner's ability to:

- provide clear and structured answers that comply with scientific and technological terminology, standards and conventions

Proficiency in Subject-Specific Knowledge

Proficiency in subject-specific knowledge presupposes its acquisition, understanding, application and mobilization, and is therefore linked with the evaluation criteria for the competencies.

Weighting³

The weighting of the parts will be distributed as follows:

- Practical Part: 40%
- Theory Part: 60%

3. The weighting of the competencies is determined in accordance with the *Framework for the Evaluation of Learning* in general education in the youth sector.

Specifications for the Evaluation Instruments

Examination: Number of Parts, Procedure and Duration

The examination consists of two parts that must be administered during different evaluation sessions.

The entire evaluation session for the practical part is carried out in a laboratory, workshop or other appropriate location. The theory part of the examination takes place in an examination room.

Practical Part

- Duration: 120 minutes

This part of the examination consists of the following documents:

- the *Adult's Booklet*
- the *Reference Document*
- the *Marking Guide*
- the *Instructions for Administering the Examination*
- the *Plan of Action* to be provided to the adult learner once their plan of action has been completed and submitted

Theory Part

- Duration: 120 minutes

This part of the examination consists of the following documents:

- the *Adult's Booklet*
- the *Reference Document*
- the *Marking Guide*
- the *Instructions for Administering the Examination*

Authorized Materials

For the two parts of the examination:

- Additional blank sheets of paper provided by the invigilator, all of which will be collected at the end of the examination.
- Calculator with or without a graphic display:
 - Note: The data and programs stored in the calculator's memory must be deleted before and after the examination.

Examination Content

Practical Part

This part involves a scenario and tasks from the *Research* family of situations. The adult learner must solve a problem related to the content of the course using the technological design process, which includes:

- the appropriate representation of the situation
- the development of a suitable plan of action
- the appropriate implementation of the plan of action
- the development of relevant explanations, solutions or conclusions

Theory Part

The distribution of subjects covered in the theory part of the examination reflects the relative importance of the compulsory concepts and knowledge to be acquired within each area of the program.

Table 2: Distribution of questions by area

Area	Distribution
The Living World	N/A
The Material World	66%
The Earth and Space	17%
The Technological World	17%

Section 1

The explicit evaluation of knowledge is carried out using multiple choice or short-answer questions or questions involving short calculations, with marks allotted according to the level of difficulty.

Section 2

This section is used to assess the adult learner's ability to analyze a scenario involving a technological application or an environmental issue. The tasks associated with the course content may fall into the following categories:

- Providing a description
- Providing an explanation
- Providing a calculation
- Providing a representation

Information-Gathering Tools

The following tools are used to gather information:

Practical Part

- the *Adult's Booklet*
- the *Checklist*, which is used by the invigilator to record their observations about the adult learner's work in the laboratory or workshop and which is then given to the marker

Theory Part

- the *Adult's Booklet*

Assessment Tools

For the practical and theory parts of the examination, the questions are marked by referring to the answer key and the marking guidelines provided in the *Marking Guide*.

For the practical part of the examination, the invigilator is provided with an information-gathering tool, which is called the *Checklist*. The use of this tool is mandatory to ensure consistency in observations made with regard to the adult learner's work in the laboratory or workshop. The *Checklist* can be found in Appendix II of the *Instructions for Administering the Examination*. Details related to the interpretation of the data collected can be found in the *Marking Guide*.

Pass Mark

The pass mark is 60% for the examination as a whole.

Retakes

The adult learner may retake each part (practical or theory) of the examination separately. However, they must be given a different version of the examination.

Appendix I – Reference Document

List of Formulas and Constants

Table 3: List of formulas provided for the examination

$I = \frac{q}{\Delta t}$	I Electric current intensity q Electrical charge Δt Time difference
$V = R \cdot I$	V Potential difference or voltage R Resistance I Electric current intensity
$R_{eq} = R_1 + R_2 + R_3 + \dots$ (in series) $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$ (in parallel)	R Resistance R_{eq} Equivalent resistance
$P = V \cdot I$	P Electrical power V Potential difference or voltage I Electric current intensity
$E = P \cdot \Delta t$	E Electrical energy P Electrical power Δt Time difference
$F_e = k \frac{q_1 \cdot q_2}{r^2}$	F_e Electrostatic force k Coulomb's constant ($k = 9 \times 10^9 \text{ N} \cdot \text{m}^2 / \text{C}^2$) q Electrical charge r Distance between the electrical charges
Energy efficiency = $\frac{\text{Useful energy}}{\text{Energy consumed}} \times 100 \%$	

List of Standard Electrical Symbols

Table 4: List of standard electrical symbols provided for the examination

Cell or direct current voltage source		Voltmeter		Wire	
Battery		Ammeter		Solenoid	
Source of alternating current		Ohmmeter		Electrical outlet	
Light bulb		Unipolar (single-pole) unidirectional (single-throw) switch		Heating element	
Fuse		Unipolar (single-pole) bidirectional (double-throw) switch		Capacitor	
Resistor		Bipolar (double-pole) unidirectional (single-throw) switch		Diode	
Relay		Bipolar (double-pole) bidirectional (double-throw) switch		Transistor	
Bell		Push-button switch		Light-emitting diode (LED)	
Speaker		Magnetic switch		Photoresistor	
Motor		Circuit breaker		Photoelectric or photovoltaic cell	

I A		Key										VIII A					
1		Element symbol										13	14	15	16	17	18
1 H hydrogen 1.01	2 He helium 4.00	Atomic number										5 B boron 10.81	6 C carbon 12.01	7 N nitrogen 14.01	8 O oxygen 16.00	9 F fluorine 19.00	10 Ne neon 20.18
3 Li lithium 6.94	4 Be beryllium 9.01	Atomic mass										13 Al aluminum 26.98	14 Si silicon 28.09	15 P phosphorus 30.97	16 S sulphur 32.07	17 Cl chlorine 35.45	18 Ar argon 39.95
11 Na sodium 22.99	12 Mg magnesium 24.31	III B	IV B	V B	VI B	VII B	VIII B			I B	II B	31 Ga gallium 69.72	32 Ge germanium 72.59	33 As arsenic 74.92	34 Se selenium 78.96	35 Br bromine 79.90	36 Kr krypton 83.80
19 K potassium 39.10	20 Ca calcium 40.08	21 Sc scandium 44.96	22 Ti titanium 47.90	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.71	29 Cu copper 63.55	30 Zn zinc 65.39	31 Ga gallium 69.72	32 Ge germanium 72.59	33 As arsenic 74.92	34 Se selenium 78.96	35 Br bromine 79.90	36 Kr krypton 83.80
37 Rb rubidium 85.47	38 Sr strontium 87.62	39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.94	43 Tc technetium 98.91	44 Ru ruthenium 101.07	45 Rh rhodium 102.91	46 Pd palladium 106.40	47 Ag silver 107.87	48 Cd cadmium 112.41	49 In indium 114.82	50 Sn tin 118.71	51 Sb antimony 121.75	52 Te tellurium 127.60	53 I iodine 126.90	54 Xe xenon 131.30
55 Cs caesium 132.91	56 Ba barium 137.33	57-71 lanthanoids	72 Hf hafnium 178.49	73 Ta tantalum 180.95	74 W tungsten 183.85	75 Re rhenium 186.21	76 Os osmium 190.20	77 Ir iridium 192.22	78 Pt platinum 195.09	79 Au gold 196.97	80 Hg mercury 200.59	81 Tl thallium 204.37	82 Pb lead 207.20	83 Bi bismuth 208.98	84 Po polonium (209)	85 At astatine (210)	86 Rn radon (222)
87 Fr francium (223)	88 Ra radium (226)	89-103 actinoids	104 Rf rutherfordium (267)	105 Db dubnium (268)	106 Sg seaborgium (271)	107 Bh bohrium (272)	108 Hs hassium (270)	109 Mt meitnerium (276)	110 Ds darmstadtium (281)	111 Rg roentgenium (280)	112 Cn copernicium (285)	113 Nh nihonium (284)	114 Fl flerovium (289)	115 Mc moscovium (288)	116 Lv livermorium (293)	117 Ts tennessine (292)	118 Og oganeson (294)
		6	57 La lanthanum 138.91	58 Ce cerium 140.12	59 Pr praseodymium 140.91	60 Nd neodymium 144.24	61 Pm promethium (145)	62 Sm samarium 150.36	63 Eu europium 151.96	64 Gd gadolinium 157.25	65 Tb terbium 158.93	66 Dy dysprosium 162.50	67 Ho holmium 164.93	68 Er erbium 167.26	69 Tm thulium 168.93	70 Yb ytterbium 173.05	71 Lu lutetium 174.97
		7	89 Ac actinium (227)	90 Th thorium 232.04	91 Pa protactinium 231.04	92 U uranium 238.03	93 Np neptunium (237)	94 Pu plutonium (244)	95 Am americium (243)	96 Cm curium (247)	97 Bk berkelium (247)	98 Cf californium (251)	99 Es einsteinium (252)	100 Fm fermium (257)	101 Md mendelevium (258)	102 No nobelium (259)	103 Lr lawrencium (262)

