This document was written primarily for:

<table>
<thead>
<tr>
<th>Role</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
</tr>
<tr>
<td>Teachers</td>
<td>✔️</td>
</tr>
<tr>
<td>Grade 9 Science</td>
<td></td>
</tr>
<tr>
<td>Administrators</td>
<td>✔️</td>
</tr>
<tr>
<td>Parents</td>
<td></td>
</tr>
<tr>
<td>General Audience</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

Alberta Education, Government of Alberta

2019–2020

Science 9 Subject Bulletin

Distribution: This document is posted on the Alberta Education website.

Copyright 2019, the Crown in Right of Alberta, as represented by the Minister of Education, Alberta Education, Provincial Assessment Sector, 44 Capital Boulevard, 10044 108 Street NW, Edmonton, Alberta T5J 5E6, and its licensors. All rights reserved.

Special permission is granted to Alberta educators only to reproduce, for educational purposes and on a non-profit basis, parts of this document that do not contain excerpted material.

Excerpted material in this document shall not be reproduced without the written permission of the original publisher (see credits, where applicable).
You can find provincial achievement test-related materials on the Alberta Education website.

Additional topics of interest are found in the General Information Bulletin.
**Grade 9 Science Provincial Achievement Test**

**General description**

The *Grade 9 Science Provincial Achievement Test* is based on science learnings in which the nature of science, technology, and society are integrated components.

Knowledge and skill components are integrated in the test. Knowledge components relate to a fundamental understanding of both the concepts and the processes of science. Skill components relate to the application of science processes and the use of higher-level thinking to solve problems. Skill components consist of three types of skill:

- inquiry skills
- technological problem-solving skills
- societal decision-making skills

This assessment consists of 55 machine-scored questions: 50 multiple-choice questions, each worth one mark, and five numerical-response questions, each worth one mark. The five numerical-response questions are interspersed among the multiple-choice questions.

The following briefly describes the two item formats:

- Multiple-choice items provide students with four response options, of which only one is correct.

- Numerical-response items require students to generate a response (in symbolic form) to a particular problem rather than selecting a response from a list of four options.

The test is developed to be completed in 75 minutes; however, students have up to 150 minutes to complete the test should they need it.

Students record their answers on a tear-out answer sheet.

Students require HB pencils and erasers. A calculator is recommended.

Students may not use a dictionary, a thesaurus, or other reference materials when writing the test.

If a word that warrants a definition is used on a test, it will be defined on the page on which it appears.

A tear-out data sheet will be included with the *Grade 9 Science Provincial Achievement Test*. A sample data sheet is included in the appendix.
Description of science assessment standards

The following statements describe what is expected of Grade 9 students at the acceptable standard and the standard of excellence based on outcomes in the program of studies.

These statements represent examples of the standards against which student achievement is measured. It is important to remember that one test cannot measure all the outcomes in the program of studies.

<table>
<thead>
<tr>
<th>Acceptable standard</th>
<th>Standard of excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students who meet the acceptable standard in Grade 9 Science have a basic understanding of the conceptual and procedural knowledge outlined in the program of studies. They are able to:</td>
<td>Students who meet the standard of excellence in Grade 9 Science have an exceptional understanding of the conceptual and procedural knowledge outlined in the program of studies. They are able to:</td>
</tr>
<tr>
<td>• apply concepts and basic procedures to simple and familiar situations, but they may be challenged when applying these concepts and procedures to unfamiliar or complex situations. For example, students are able to describe ongoing changes in biological diversity through extinction and extirpation of native species, but they may have difficulty interpreting the role of environmental factors in causing these changes.</td>
<td>• apply knowledge in complex and novel situations. For example, not only can they identify the chemical factors that affect the health and distribution of living things, but they can also predict the possible outcomes of changing chemical factors on living things and evaluate their effects on the quality of the environment.</td>
</tr>
<tr>
<td>• use basic skills to show what they know and solve novel, real-life problems that are simple or that require single-step solutions</td>
<td>• apply higher-level thinking skills to unfamiliar situations. In addition, they can easily and quickly solve problems that they have direct experience with and that require single-step or multi-step solutions.</td>
</tr>
<tr>
<td>• apply more advanced skills or follow multi-step procedures to solve familiar real-life problems in which they have had experience. For example, in a problem-solving activity to identify problems in developing technology for life in space, these students will be able to describe technologies for life-support systems. However, students likely will not interpret the scientific principles on which the technologies are based.</td>
<td>• solve problems in more than one way and see more than one solution to some problems. Their problem-solving approach may involve more than one manipulated variable and may include logical explanations of procedures and results.</td>
</tr>
<tr>
<td>• use the basic procedures of scientific inquiry, technological problem solving, and societal decision making. However, they may have difficulty with the application of more advanced skills, and they may have limited ability to make connections between science, technology, and society.</td>
<td>• persistently solve problems and view a situation from a number of perspectives. Not only do they have a high level of awareness and understanding of how science and technology affect them personally, but they can also apply this awareness and understanding to societal issues.</td>
</tr>
<tr>
<td></td>
<td>• skillfully use the basic procedures of scientific inquiry, technological problem solving, and societal decision making</td>
</tr>
<tr>
<td></td>
<td>• use advanced skills and make connections between science, technology, and society</td>
</tr>
</tbody>
</table>
**Blueprint**

The blueprint below shows the topics and reporting categories under which questions are classified. The number of questions in each reporting category is approximate.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Question Distribution by Reporting Category</th>
<th>Number (Percentage) of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Knowledge</td>
<td>Skills</td>
</tr>
<tr>
<td>Biological Diversity</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Matter and Chemical Change</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Environmental Chemistry</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Electrical Principles and Technologies</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Space Exploration</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Number (Percentage) of Questions</td>
<td>22 (40%)</td>
<td>33 (60%)</td>
</tr>
</tbody>
</table>
Preparing Students for the Provincial Achievement Test

Suggestions for preparing students

The best way to prepare students for writing the provincial achievement test is to teach the curriculum well and to ensure that students know what is expected. Many of the skills and attitudes that support test writing are, in fact, good skills and strategies for approaching all kinds of learning tasks.

Note that the questions on the science test are placed in real-life contexts.

Teachers are encouraged to familiarize their students with the types of questions that will appear on the test. Released materials from previously secured tests are available on the Alberta Education website.

Teachers are also encouraged to share the following information with their students to help them prepare for the Grade 9 Science Provincial Achievement Test.

Special-format practice tests

To give students an opportunity to practise provincial achievement test-style questions and content in Braille, audio, large print, or coloured print versions, Alberta Education produces special-format practice tests for all subjects that have a provincial achievement test. Alberta schools with registered Alberta K–12 students may place orders for these tests. Braille versions are available in English and, by request, in French. All tests are provided free of charge, but limits may be placed on order volumes to ensure access for all students.

For the greatest benefit, special-format practice tests should be written under conditions similar to those of the corresponding provincial achievement test. The same rules regarding the use of resources and devices should be followed.

Braille versions must be returned to Alberta Education after use.

For more information or to place an order, contact

Laura LaFramboise
Distribution Coordinator, Examination Administration
780-641-9116 or Laura.LaFramboise@gov.ab.ca
Suggestions for answering questions

• Before you begin, find out how much time you have.

• Ask questions if you are unsure of anything.

• Skim through the whole test before beginning. Find out how many questions there are, and plan your time accordingly.

• Answer the easier questions first; then go back to the more difficult ones.

• Do not spend too much time on any one question. Make a mark (∗ or ?) beside any questions you have difficulty with, and go back to them if you have time.

• Read each question carefully, underline or highlight key words, and try to determine an answer before looking at the choices.

• Read all the choices and see which one best fits the answer.

• When you are not sure which answer is correct, cross out any choices that are wrong and then select the best of the remaining choices.

• If time permits, recheck your answers.

• Double-check to make sure that you have answered everything before handing in the test.

• Read the information given using the strategy that works best for you. You should either
  – look at all the information and think carefully about it before you try to answer the question

  OR

  – read the questions first and then look at the information, keeping in mind the questions you need to answer

• Make sure that you look at all forms of the information given. Information may be given in words, charts, pictures, graphs, or maps.

• When information is given for more than one question, go back to the information before answering each question.

• Check your work when you calculate an answer, even when your answer is one of the choices.

When answering “best answer” questions, be sure to carefully read all four alternatives (A, B, C, and D) before choosing the answer that you think is best. These questions will always include a boldfaced qualifier such as best, most strongly, or most clearly in their stems. All the alternatives (A, B, C, and D) are, to some degree, correct, but one of the alternatives will be “best” in that it takes more of the information into account or can be supported most strongly by reference to the information.
Opportunities to Participate in Test-development Activities

Field testing

All provincial achievement test questions are field tested before use. By “testing” the test questions, students who write field tests have an opportunity for a practice run at answering questions that could be used on future provincial achievement tests. As well, the teachers have an opportunity to comment on the appropriateness and quality of the test questions.

Through the online field-test request system, teachers can create and modify field-test requests and check the status of these requests. Information regarding the field-test process and the request system is available at Provincial Achievement Tests.

Once the completed requests are received by the Provincial Assessment Sector, classes will be selected to ensure that a representative and sufficiently large sample of students from across the province take part in the field test. Every effort will be made to place field tests as requested; however, because field tests are administered to a prescribed number of students, it may not be possible to fill all requests.

*NEW Working groups

Teacher involvement in the development of provincial achievement tests is important because it helps to ensure the validity and appropriateness of the assessments.

Teacher working groups are used throughout the test-development process to create raw forms of test questions and to review and revise draft forms of provincial achievement tests. These working groups usually meet for one or two days, two or three times per year. Occasionally, these meetings are held on weekends.

To be eligible to serve on a test-development working group, a teacher must currently be teaching the course in question or must have taught the course within the past three years.

Teachers participating in working groups are selected from the working-group nominees approved by superintendents of school jurisdictions. The call for nominations usually occurs in September. However, we will accept further nominations throughout the year. In some subjects, more teachers may be nominated for working groups than are needed. When teachers are selected, there must be a balance of first-time and experienced working-group members and regional representation by zone, school authority, and school. Unfortunately, not everyone whose name is submitted will be selected.
Depth of Coverage

Mechanical energy

A clear understanding of the transformations of energy before its intended use is necessary to discuss efficiency comparisons. The mechanical energy of an object or a system is the sum of the potential and kinetic energy of the object or system.

WHMIS 2015

As of the 2019–2020 school year, any Workplace Hazardous Materials Information System (WHMIS) pictograms that appear on provincial assessments will be WHMIS 2015 pictograms. WHMIS has been used in Canada since 1988 for labelling and classifying hazardous workplace chemicals. Countries around the world are adopting the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) to enable a consistent international chemical classification and labelling system. WHMIS 1988 in Canada was amended in February 2015 to incorporate the GHS. The new system is called WHMIS 2015.

WHMIS 2015 includes changes to

- pictograms
- labels
- hazard classes and categories
- safety data sheets
- education and training

Further information about these changes can be found at Science (7-9) Program Supports under the heading Health and Safety in the Science Classroom.
# Pictograms

## WHMIS 2015

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame</td>
<td>For fire hazards</td>
</tr>
<tr>
<td>Flame Over Circle</td>
<td>For oxidizing hazards</td>
</tr>
<tr>
<td>Gas Cylinder</td>
<td>For gases under pressure</td>
</tr>
<tr>
<td>Exploding Bomb</td>
<td>For explosion or reactivity hazards</td>
</tr>
<tr>
<td>Biohazardous Infectious Materials</td>
<td>For organisms or toxins that can cause diseases in people or animals</td>
</tr>
<tr>
<td>Corrosion</td>
<td>For corrosive damage to metals, as well as skin, eyes</td>
</tr>
<tr>
<td>Exclamation Mark</td>
<td>May cause less serious health effects</td>
</tr>
<tr>
<td>Health Hazard</td>
<td>May cause or suspected of causing serious health effects</td>
</tr>
<tr>
<td>Skull and Crossbones</td>
<td>Can cause death or toxicity with short exposure to small amounts</td>
</tr>
</tbody>
</table>
### Appendix 1: Science 9 Data Sheet

**Science 9 Two-sided Data Sheet (Electricity Formulas on Back)**

#### Periodic Table of the First Eighteen Elements

<table>
<thead>
<tr>
<th>Atomic number</th>
<th>Element</th>
<th>Symbol</th>
<th>Name</th>
<th>Atomic mass</th>
<th>Most common ion charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td>H</td>
<td>hydrogen</td>
<td>1.01</td>
<td>1+</td>
</tr>
<tr>
<td>2</td>
<td>He</td>
<td>He</td>
<td>helium</td>
<td>4.00</td>
<td>2+</td>
</tr>
<tr>
<td>3</td>
<td>Li</td>
<td>Li</td>
<td>lithium</td>
<td>6.94</td>
<td>1+</td>
</tr>
<tr>
<td>4</td>
<td>Be</td>
<td>Be</td>
<td>beryllium</td>
<td>9.01</td>
<td>2+</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>B</td>
<td>boron</td>
<td>10.81</td>
<td>3+</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>C</td>
<td>carbon</td>
<td>12.01</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>N</td>
<td>N</td>
<td>nitrogen</td>
<td>14.01</td>
<td>3-</td>
</tr>
<tr>
<td>8</td>
<td>O</td>
<td>O</td>
<td>oxygen</td>
<td>16.00</td>
<td>2-</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>F</td>
<td>fluorine</td>
<td>19.00</td>
<td>1-</td>
</tr>
<tr>
<td>10</td>
<td>Ne</td>
<td>Ne</td>
<td>neon</td>
<td>20.18</td>
<td>3-</td>
</tr>
<tr>
<td>11</td>
<td>Na</td>
<td>Na</td>
<td>sodium</td>
<td>22.99</td>
<td>1+</td>
</tr>
<tr>
<td>12</td>
<td>Mg</td>
<td>Mg</td>
<td>magnesium</td>
<td>24.31</td>
<td>2+</td>
</tr>
<tr>
<td>13</td>
<td>Al</td>
<td>Al</td>
<td>aluminium</td>
<td>26.98</td>
<td>3+</td>
</tr>
<tr>
<td>14</td>
<td>Si</td>
<td>Si</td>
<td>silicon</td>
<td>28.09</td>
<td>4+</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>P</td>
<td>phosphorus</td>
<td>30.97</td>
<td>5-</td>
</tr>
<tr>
<td>16</td>
<td>S</td>
<td>S</td>
<td>sulfur</td>
<td>32.07</td>
<td>2-</td>
</tr>
<tr>
<td>17</td>
<td>Cl</td>
<td>Cl</td>
<td>chlorine</td>
<td>35.45</td>
<td>1-</td>
</tr>
<tr>
<td>18</td>
<td>Ar</td>
<td>Ar</td>
<td>argon</td>
<td>39.95</td>
<td>3-</td>
</tr>
</tbody>
</table>

**Legend for Elements**
- **Solid**
- **Gas**
- **Liquid**

**Note:** The legend denotes the states of elements at a temperature of 25 °C.
Electricity Formulas

\[ R = \frac{V}{I} \]

\[ E = Pt \]

\[ P = IV \]

Percent efficiency = \( \left( \frac{\text{output}}{\text{input}} \right) \times 100\% \)
Appendix 2: Example of Grade 9 Science 2020 PAT Instructions Pages

Grade 9 Provincial Achievement Test

Science

Description

• This test consists of 55 machine-scored questions: 50 multiple-choice questions, each worth one mark, and 5 numerical-response questions, each worth one mark.

Time: 75 minutes. You have up to 150 minutes to complete this test should you need it.

Instructions

• Turn to the last two pages of the test booklet. Carefully fold and tear out the 2-sided data sheet and the machine-scored answer sheet along the perforations.

• Calculators are recommended but not required.

• You may not use a dictionary, a thesaurus, or other reference materials.

• Read each question carefully and choose the correct or best answer.

• Make sure that the number of the question on your answer sheet matches the number of the question that you are answering.

• Use only an HB pencil to mark your answer.

• If you change an answer, erase your first mark completely.

• Try to answer every question.

• When you have completed the test, please answer the survey question, which appears after the last test question.

• Now read the detailed instructions for answering multiple-choice and numerical-response questions.

You may write in this booklet if you find it helpful. Make sure that your answers are placed on the answer sheet.

2020
Multiple Choice

• Each question has four possible answers from which you are to choose the correct or best answer.

• Locate the question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

Examples

This test is for the subject of
A. science
B. mathematics
C. language arts
D. social studies

Answer Sheet
①②③④

Which of the following rows identifies the subject and grade level of this test?

<table>
<thead>
<tr>
<th>Row</th>
<th>Subject</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Science</td>
<td>8</td>
</tr>
<tr>
<td>B</td>
<td>Science</td>
<td>9</td>
</tr>
<tr>
<td>C</td>
<td>Mathematics</td>
<td>8</td>
</tr>
<tr>
<td>D</td>
<td>Mathematics</td>
<td>9</td>
</tr>
</tbody>
</table>

Answer Sheet
①②③④

When there are no clouds, during the day the sky appears i and at night the sky appears ii.

The statement above is completed by the information in row

<table>
<thead>
<tr>
<th>Row</th>
<th>i</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>blue</td>
<td>blue</td>
</tr>
<tr>
<td>B</td>
<td>blue</td>
<td>black</td>
</tr>
<tr>
<td>C</td>
<td>white</td>
<td>blue</td>
</tr>
<tr>
<td>D</td>
<td>white</td>
<td>black</td>
</tr>
</tbody>
</table>

Answer Sheet
①②③④

Numerical Response

• Record your answer on the answer sheet provided by writing it in the boxes and then by filling in the corresponding circles.

• Enter your answer, one digit per box, beginning in the left-hand box. A decimal point, if needed, goes in its own box. Leave any unused boxes blank.

Examples

Calculation Question and Solution

\[ D = \frac{m}{V} \]

What is the density of a liquid if 95.0 g of the liquid has a volume of 15.2 mL?

Density = ______ g/mL

(Record your three-digit answer in the numerical-response section on the answer sheet.)

Answer: 6.25

Record 6.25 on the answer sheet

Fill in the corresponding circles

Answer Sheet
①②③④
Sequencing Question and Solution

Listed below are three electrical appliances.

1. Oven
2. Toaster
3. Blender

When the appliances listed above are placed in alphabetical order, the order is ______, _______, and _______.

(Record all **three digits** of your answer in the numerical-response section on the answer sheet.)

Answer: 312

Record 312 on the answer sheet

Multiple-answer Matching Question and Solution

<table>
<thead>
<tr>
<th>Continent</th>
<th>Country</th>
<th>Capital City</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>France</td>
<td>Beijing</td>
</tr>
<tr>
<td>Europe</td>
<td>China</td>
<td>Ottawa</td>
</tr>
<tr>
<td>Asia</td>
<td>Canada</td>
<td>Paris</td>
</tr>
</tbody>
</table>

Using the numbers above, choose one continent and match it with a country in that continent and with that country’s capital city. (There is more than one correct answer.)

Number: _______ _______ _______

(Record all **three digits** of your answer in the numerical-response section on the answer sheet.)

Answer: 168 or 249 or 357

Record 168 on the answer sheet

Note: The answers 168, 249, or 357 will be scored as correct.
Appendix 3: General Purpose Answer Sheet
Contacts 2019–2020

Provincial Assessment Sector

Dan Karas, Executive Director
Provincial Assessment Sector
780-422-4848
Dan.Karas@gov.ab.ca

Grade 3, 6, and 9 Provincial Assessment

Nicole Lamarre, Director
Student Learning Assessments and Provincial Achievement Testing
780-427-6204
Nicole.Lamarre@gov.ab.ca

Gilbert Guimont, Director
French Assessment
780-422-3535
Gilbert.Guimont@gov.ab.ca

Senior Managers

Julia Lee-Schuppli
Gr. 3 English Language/Literacy
780-422-3338
Julia.LeeSchuppli@gov.ab.ca

Renate Taylor Majeau
Gr. 3 Numeracy (English and French)
780-422-2656
Renate.TaylorMajeau@gov.ab.ca

Peggy Lee Peters
Gr. 3 Francophone and French Immersion Literacy
780-422-5464
Peggy.LeePeters@gov.ab.ca

Robyn Pederson
Gr. 6 English Language Arts and Social Studies
780-415-2023
Robyn.Pederson@gov.ab.ca

Denis Dinel
Gr. 6 and 9 Français/French Language Arts
780-422-9424
Denis.Dinel@gov.ab.ca

Vanessa Tran
Gr. 6 and 9 Mathematics
780-422-1114
Vanessa.Tran@gov.ab.ca

Kelty Findlay
Gr. 6 and 9 Science
780-415-6120
Kelty.Findlay@gov.ab.ca

Harvey Stables
Gr. 9 English Language Arts and Social Studies
780-422-2913
Harvey.Stables@gov.ab.ca

Ray Shapka
Knowledge & Employability (K&E)
780-422-2786
Ray.Shapka@gov.ab.ca

Exam Administration

Pascal Couture, Director
Exam Administration
780-643-9157
Pascal.Couture@gov.ab.ca

Pamela Klebanov, Senior Manager
Business Operations and Special Cases
780-427-1912
Pamela.Klebanov@gov.ab.ca

Amy Wu, Coordinator
Business Coordinator (Field Testing, GED and Special Cases and Accommodations)
780-415-9242
Amy.Wu@gov.ab.ca

Inquiries about special cases, provincial achievement test accommodations, and special-format materials can be sent by email to special.cases@gov.ab.ca

Inquiries about field testing can be sent by email to field.test@gov.ab.ca

Provincial Assessment Sector

mailing address
Provincial Assessment Sector, Alberta Education
44 Capital Boulevard
10044 108 Street NW
Edmonton AB T5J 5E6

Telephone: 780-427-0010
Toll-free within Alberta: 310-0000
Fax: 780-422-4200

Alberta Education website:
education.alberta.ca

Workforce Development Help Desk

Telephone: 780-427-5318
Toll-free within Alberta: 310-0000
Email: WFDhelpdesk@gov.ab.ca

Office hours:
Monday through Friday, 8:15 a.m. to 4:30 p.m. The office is open during the lunch hour.