

Grade 9
Subject Bulletin
Science

Alberta Provincial Achievement Testing 2019–2020

This document was written primarily for:

Students	
Teachers	✓ Grade 9 Science
Administrators	✓
Parents	
General Audience	
Others	

Alberta Education, Government of Alberta

2019–2020

Science 9 Subject Bulletin

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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.

Acceptable standard	Standard of excellence
<p>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</p> <ul style="list-style-type: none"> • 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. • use basic skills to show what they know and solve novel, real-life problems that are simple or that require single-step solutions • 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. • 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. 	<p>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</p> <ul style="list-style-type: none"> • 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. • 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. • 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. • 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. • skillfully use the basic procedures of scientific inquiry, technological problem solving, and societal decision making • use advanced skills and make connections between science, technology, and society

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.

Topic	Question Distribution by Reporting Category		Number (Percentage) of Questions
	Knowledge	Skills	
Biological Diversity	5	6	11 (20%)
Matter and Chemical Change	5	6	11 (20%)
Environmental Chemistry	4	7	11 (20%)
Electrical Principles and Technologies	3	8	11 (20%)
Space Exploration	5	6	11 (20%)
Number (Percentage) of Questions	22 (40%)	33 (60%)	55 (100%)

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
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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

<p>Flame</p>  <p>For fire hazards</p>	<p>Flame Over Circle</p>  <p>For oxidizing hazards</p>	<p>Gas Cylinder</p>  <p>For gases under pressure</p>
<p>Exploding Bomb</p>  <p>For explosion or reactivity hazards</p>	<p>Biohazardous Infectious Materials</p>  <p>For organisms or toxins that can cause diseases in people or animals</p>	<p>Corrosion</p>  <p>For corrosive damage to metals, as well as skin, eyes</p>
<p>Exclamation Mark</p>  <p>May cause less serious health effects</p>	<p>Health Hazard</p>  <p>May cause or suspected of causing serious health effects</p>	<p>Skull and Crossbones</p>  <p>Can cause death or toxicity with short exposure to small amounts</p>

Appendix 1: Science 9 Data Sheet

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

Periodic Table of the First Eighteen Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1.01 1+ H hydrogen	6.94 1+ Li lithium	6.94 1+ Li lithium	9.01 2+ Be beryllium	11 22.99 1+ Na sodium	13 26.98 3+ Al aluminum	14 28.09 4+ Si silicon	15 30.97 3- P phosphorus	16 32.07 2- S sulfur	17 35.45 1- Cl chlorine	18 39.95 0 Ar argon								

Legend for Elements

Solid	Gas	Liquid
-------	-----	--------

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

Key

Atomic number	6.94	Atomic mass	6.94
Symbol	Li	Most common ion charge	1+
		Name	lithium

Electricity Formulas

$$R = \frac{V}{I}$$

$$E = Pt$$

$$P = IV$$

$$\text{Percent efficiency} = \left(\frac{\text{output}}{\text{input}} \right) \times 100\%$$

*NEW Appendix 2: Example of Grade 9 Science 2020 PAT Instructions Pages

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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.

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

2020

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.

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

● (B) (C) (D)

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

Row	Subject	Grade
A.	Science	8
B.	Science	9
C.	Mathematics	8
D.	Mathematics	9

Answer Sheet

(A) ● (C) (D)

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

Row	<i>i</i>	<i>ii</i>
A.	blue	blue
B.	blue	black
C.	white	blue
D.	white	black

Answer Sheet

(A) ● (C) (D)

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

→

6	.	2	5
---	---	---	---

● ●
 (0) (0) (0) (0)
 (1) (1) (1) (1)
 (2) (2) ● (2)
 (3) (3) (3) (3)
 (4) (4) (4) (4)
 (5) (5) (5) ●
 ● (6) (6) (6)
 (7) (7) (7) (7)
 (8) (8) (8) (8)
 (9) (9) (9) (9)

Fill in the corresponding circles

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

→

3	1	2	
---	---	---	--

• •
 (0) (0) (0) (0)
 (1) (●) (1) (1)
 (2) (2) (●) (2)
 (●) (3) (3) (3)
 (4) (4) (4) (4)
 (5) (5) (5) (5)
 (6) (6) (6) (6)
 (7) (7) (7) (7)
 (8) (8) (8) (8)
 (9) (9) (9) (9)

} Fill in the corresponding circles

Multiple-answer Matching Question and Solution

Continent	Country	Capital City
1 North America	4 France	7 Beijing
2 Europe	5 China	8 Ottawa
3 Asia	6 Canada	9 Paris

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: _____
Description:

Continent (1, 2, or 3)	Country (4, 5, or 6)	Capital city (7, 8, or 9)
---------------------------	-------------------------	------------------------------

(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

→

1	6	8	
---	---	---	--

• •
 (0) (0) (0) (0)
 (●) (1) (1) (1)
 (2) (2) (2) (2)
 (3) (3) (3) (3)
 (4) (4) (4) (4)
 (5) (5) (5) (5)
 (6) (●) (6) (6)
 (7) (7) (7) (7)
 (8) (8) (●) (8)
 (9) (9) (9) (9)

} Fill in the corresponding circles

Note: The answers 168, 249, or 357 will be scored as correct.

Appendix 3: General Purpose Answer Sheet

NUMERICAL RESPONSE

1 2 3

4 5

0 0 0 0 0
1 1 1 1 1
2 2 2 2 2
3 3 3 3 3
4 4 4 4 4
5 5 5 5 5
6 6 6 6 6
7 7 7 7 7
8 8 8 8 8
9 9 9 9 9

MULTIPLE CHOICE

1 (A) (B) (C) (D) 21 (A) (B) (C) (D) 31 (A) (B) (C) (D) 41 (A) (B) (C) (D)

2 (A) (B) (C) (D) 22 (A) (B) (C) (D) 32 (A) (B) (C) (D) 42 (A) (B) (C) (D)

3 (A) (B) (C) (D) 23 (A) (B) (C) (D) 33 (A) (B) (C) (D) 43 (A) (B) (C) (D)

4 (A) (B) (C) (D) 24 (A) (B) (C) (D) 34 (A) (B) (C) (D) 44 (A) (B) (C) (D)

5 (A) (B) (C) (D) 25 (A) (B) (C) (D) 35 (A) (B) (C) (D) 45 (A) (B) (C) (D)

6 (A) (B) (C) (D) 26 (A) (B) (C) (D) 36 (A) (B) (C) (D) 46 (A) (B) (C) (D)

7 (A) (B) (C) (D) 27 (A) (B) (C) (D) 37 (A) (B) (C) (D) 47 (A) (B) (C) (D)

8 (A) (B) (C) (D) 28 (A) (B) (C) (D) 38 (A) (B) (C) (D) 48 (A) (B) (C) (D)

9 (A) (B) (C) (D) 29 (A) (B) (C) (D) 39 (A) (B) (C) (D) 49 (A) (B) (C) (D)

10 (A) (B) (C) (D) 30 (A) (B) (C) (D) 40 (A) (B) (C) (D) 50 (A) (B) (C) (D)

Day

	0	1	2	3	4	5	6	7	8	9
--	---	---	---	---	---	---	---	---	---	---

January
 May
 June

Time Taken:

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
--	-----	-----	-----	-----	-----	-----	-----

Fold and tear along perforation.

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***NEW**

***NEW**

***NEW**