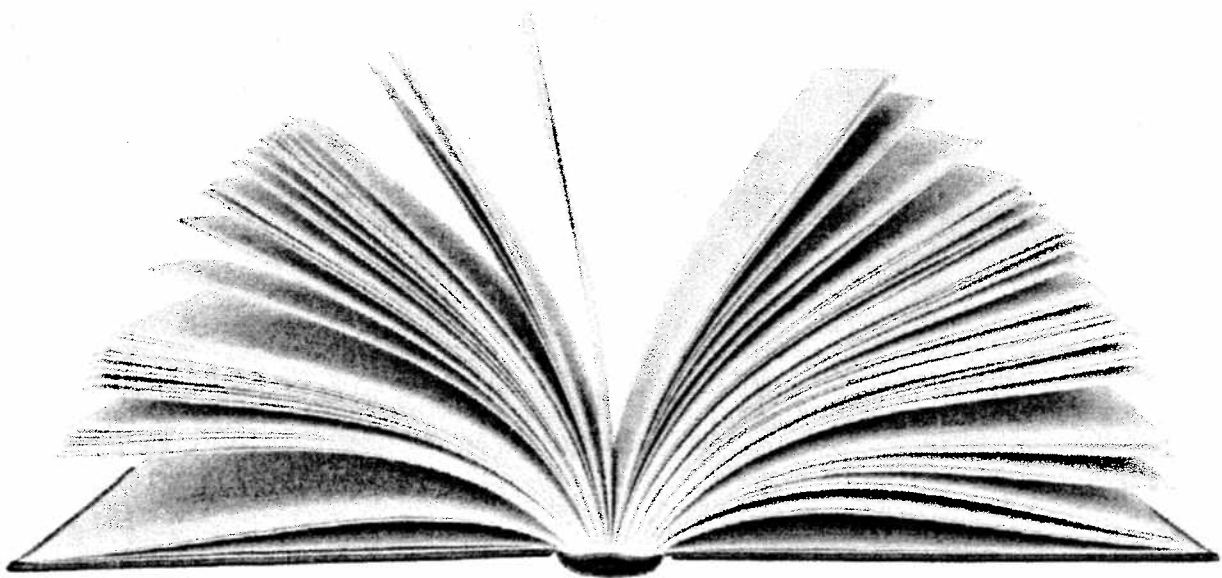


Assessment Highlights
Grade 9 Science
2007
and
A Released Achievement Test



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The 2007 Grade 9 Science Achievement Test

This report provides teachers, school administrators, and the public with an overview of the performance of those students who wrote the 2007 Grade 9 Science Achievement Test. It complements the detailed school and jurisdiction reports.

How Many Students Wrote the Test?

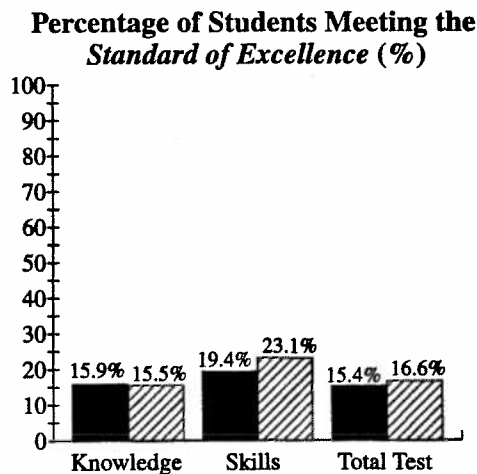
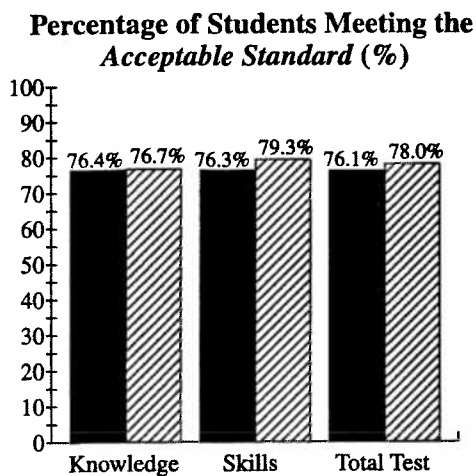
A total of 37 375 students wrote the 2007 Grade 9 Science Achievement Test.

What Was the Test Like?

The 2007 Grade 9 Science Achievement Test consisted of 50 multiple-choice questions and 5 numerical-response questions based on five science topics: Unit A—Biological Diversity; Unit B—Matter and Chemical Change; Unit C—Environmental Chemistry; Unit D—Electrical Principles and Technologies; and Unit E—Space Exploration.

How Well Did Students Do?

The percentages of students meeting the *acceptable standard* and the *standard of excellence* in 2007 compared with 2006 are shown in the graphs below. Out of a total possible score of 55, the provincial average was 36.9 (67.1%). The results presented in this report are based on scores achieved by all students who wrote the test except those in French Immersion and Francophone programs (results for these students are reported separately). Detailed provincial assessment results are provided in school and jurisdiction reports.



- 2006 Achievement Standards: The percentage of students in the province who met the *acceptable standard* and the *standard of excellence* on the 2006 Grade 9 Science Achievement Test (based on those who wrote).
- ▨ 2007 Achievement Standards: The percentage of students in the province who met the *acceptable standard* and the *standard of excellence* on the 2007 Grade 9 Science Achievement Test (based on those who wrote).

Commentary on 2007 Student Achievement

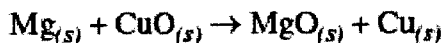
The following is a brief summary of the areas where most students experienced difficulties and demonstrated strengths on the 2007 Grade 9 Science Achievement Test. Four sample questions are also provided to highlight some of these areas. These questions are no longer secured and will not be reused on future achievement tests.

Students demonstrated relative strength by being able to:

- describe, in general terms, the relationship between chromosomes, genes, and DNA, and interpret their role as repositories of genetic information
- describe familiar chemical reactions, and represent these reactions by using word equations and chemical formulas
- recognize that biomagnification is the process by which toxins become concentrated in the food chain
- evaluate the use of different chemicals and designs for electrical storage cells
- make predictions about the motion and alignment of bodies in space that would result in a solar eclipse

For **multiple-choice 11**, a Skills question, students had to match a given chemical equation with the appropriate word equation. This question requires students to correctly identify chemical formulas using IUPAC naming conventions. Approximately 89.2% of students who met the *acceptable standard* and 98.8% of students who met the *standard of excellence* answered this question correctly.

Use the following information to answer question 11.



11. Which of the following word equations correctly restates the equation above?

- A. Magnesium + copper → magnesium oxide + copper(II) oxide
- B. Magnesium + copper → magnesium oxide + oxide copper(II)
- C. Magnesium + copper(II) oxide → magnesium oxide + copper
- D. Magnesium + oxide copper(II) → magnesium oxide + copper

4.0% of students chose A;
2.4% of students chose B;
84.9% of students chose C (correct answer); and
8.7% of students chose D.

Students experienced relative difficulty with:

- analyzing the trends on a population graph to identify the niche of a species
- identifying conditions under which properties of a material are changed, and critically evaluating whether a new substance has been produced (differentiating between chemical and physical changes)
- synthesizing data from a table and information from a graph to determine the phosphate levels in a river (using biological monitoring as a method for determining environmental quality)
- recognizing that light bulb filaments should be made of a metal that has a high resistance
- identifying evidence for, and describing characteristics of, bodies that make up the solar system and describing, in general terms, the distribution of matter in space

For **multiple-choice 20**, a Skills question, students had to identify two processes that caused physical changes to occur. Students must understand that physical changes do not result in a new substance being formed. Approximately 37.9% of students who met the *acceptable standard* and 78.8% of students who met the *standard of excellence* answered this question correctly.

Use the following table to answer question 20.

Observations from Four Experiments That Involve Mixtures

Experiment	Procedure	Observation
I	White powder is added to water.	Gas is given off.
II	A solution is heated until it boils.	Vapour rises, and solute is left in the beaker.
III	Yellow powder is added to water.	Powder dissolves.
IV	A pure solution is added to another pure solution.	A powder appears at the bottom of the beaker.

20. In which two of the experiments above did a physical change occur?

- A.** I and III
- B.** I and IV
- C.** II and III
- D.** II and IV

15.4% of students chose A;
12.0% of students chose B;
41.7% of students chose C (correct answer); and
30.8% of students chose D.

Achievement Testing Program Support Documents

The Alberta Education web site contains several documents that provide valuable information about various aspects of the Achievement Testing Program. To access these documents, go to the Alberta Education web site at www.education.gov.ab.ca. On the home page, click on “Kindergarten to Grade 12,” scroll down and click on “Provincial Testing,” and then click on the link for “Achievement Tests.” On the “Achievement Tests” web page, you can access the following documents:

Achievement Testing Program General Information Bulletin

The General Information Bulletin is a compilation of several documents produced by Alberta Education and is intended to provide superintendents, principals, and teachers with easy access to information about all aspects of the achievement testing program. Sections in the bulletin contain information pertaining to schedules and significant dates; security and test rules; test administration and directives; test accommodations; field testing; resources and web documents; calculator and computer policies; test marking and results; samples, forms, and letters; and Learner Assessment contacts.

Subject Bulletins

At the beginning of each school year, Subject Bulletins are posted on the Alberta Education web site for all achievement testing subjects for Grades 3, 6, and 9. Each bulletin provides descriptions of assessment standards, test design and blueprinting, and scoring guides (for Grades 3, 6, and 9 English Language Arts and Français/French Language Arts) as well as suggestions for preparing students to write the tests and information about how teachers can participate in test development activities.

Writing Samples

For achievement tests in Grades 3, 6, and 9 English Language Arts and Français/French Language Arts, writing samples have been designed to be used by teachers and students to enhance students’ writing and to assess this writing relative to the standards inherent in the scoring guides for the *Part A: Writing* achievement tests. The writing samples documents contain sample responses with scoring rationales, student self-assessment checklists, and scoring categories and criteria for the writing assignments.

Previous Achievement Tests and Answer Keys

All January achievement tests (parts A and B) for Grade 9 semestered students are secured and must be returned to Alberta Education. All May/June achievement tests are secured except Part A of Grades 3, 6, and 9 English Language Arts and Français/French Language Arts. Unused or extra copies of only these Part A tests may be kept at the school after administration. Teachers may use the print versions of released items that are mailed to schools in the fall of each year.

Parent Guides

Each school year, print versions of the Parent Guide to Provincial Achievement Testing for Grades 3, 6, and 9 are mailed to schools and posted on the Alberta Education web site. Each guide presents answers to frequently asked questions about the achievement testing program, sample questions for each achievement testing subject, and excerpts from the Curriculum Handbook for Parents identifying what students should know and be able to do in each subject by the end of Grades 3, 6, and 9.

Involvement of Teachers

Teachers of Grades 3, 6, and 9 are encouraged to take part in a variety of activities related to the achievement testing program. These activities include item development, test validation, field testing, and marking. In addition, regional consortia can make arrangements for teacher in-service workshops on topics such as Interpreting Achievement Test Results to Improve Student Learning.

The table below provides information about each question on the 2006 test: the keyed response, the difficulty of the item (the percentage of students who answered the question correctly), the reporting category, the topic, and the item description.

Question	Key	Diff. %	Reporting Category	Topic	Item Description
1	A	74.9	Knowledge	Biological Diversity	Identify an egg cell as having the same number of chromosomes as a sperm cell
2	D	69.9	Knowledge	Biological Diversity	Know that a specified agricultural procedure is an example of genetic engineering
3	C	55.7	Skills	Biological Diversity	Identify the biological process depicted in a diagram
4	A	57.4	Skills	Biological Diversity	Interpret information to identify the niche of a particular species
5	B	70.2	Knowledge	Biological Diversity	Analyze characteristics of a given species to determine the method by which it reproduces
6	A	72.3	Skills	Biological Diversity	Given a number of biotechnology practices, identify the practice that has the longest historical roots
7	This item was deleted in 2006.				
8	A	79.0	Skills	Biological Diversity	Read and interpret an informational passage to identify the role of variation in species survival under changing environmental conditions
9	B	71.3	Knowledge	Biological Diversity	Recognize a species that has undergone extirpation
10	D	62.5	Skills	Biological Diversity	Identify common non-heritable traits presented in a table
11	C	82.7	Skills	Matter & Chemical Change	Restate a chemical equation using words
12	B	73.8	Knowledge	Matter & Chemical Change	Use simple models and chemical names to determine a chemical formula
13	C	41.6	Skills	Matter & Chemical Change	Using given information, identify two processes that caused physical changes to occur
14	C	53.3	Skills	Matter & Chemical Change	Determine the number of atoms present in a compound
15	D	80.4	Knowledge	Matter & Chemical Change	Identify the correct statement about an element given an excerpt from the periodic table
16	C	42.7	Skills	Matter & Chemical Change	Identify the element that has a particular given property, based on its grouping in the periodic table

Question	Key	Diff. %	Reporting Category	Topic	Item Description
34	A	71.0	Skills	Electrical Principles & Technologies	Identify which component on a diagram of a hydro flow model represents a given element in an electric circuit
35	B	67.4	Skills	Electrical Principles & Technologies	Determine which circuit would provide the dimmest light, given four different series and parallel circuits
36	A	36.0	Skills	Electrical Principles & Technologies	Recognize the correct description of the characteristics of a micro electric circuit
37	B	70.6	Skills	Electrical Principles & Technologies	Recall the part of a wet cell that is acidic
38	B	52.1	Skills	Electrical Principles & Technologies	Identify the schematic diagram that illustrates a described circuit
39	This item is still secured and will not be released at this time.				
40	D	79.0	Knowledge	Electrical Principles & Technologies	Identify an action that will not reduce energy consumption in household devices
41	C	75.4	Knowledge	Space Exploration	Recall the characteristics of different models of the universe
42	C	64.1	Knowledge	Space Exploration	Recall that planets make elliptical orbits around the sun
43	C	51.5	Skills	Space Exploration	Select the graph that represents a given relationship
44	A	71.7	Knowledge	Space Exploration	Recall why planets are visible from Earth on a clear night
45	C	72.0	Knowledge	Space Exploration	Recall why astronomers use triangulation
46	D	53.9	Skills	Space Exploration	Recognize true and false statements about refracting telescopes
47	A	59.6	Skills	Space Exploration	Determine the coordinates of a celestial object given its approximate location
48	B	45.7	Skills	Space Exploration	Identify the orbit a communication satellite must follow to provide a specific service
49	B	64.9	Knowledge	Space Exploration	Select the generalization that best describes the outer planets of our solar system
50	D	63.2	Skills	Space Exploration	Apply knowledge of the Doppler effect and spectroscopy to describe a red shift in spectra
NR1	2314	79.3	Skills	Biological Diversity	Identify which variables in a description represent an organism's ecosystem, niche, species, and adaptations
NR2	3412	66.4	Knowledge	Matter & Chemical Change	Match WHMIS symbols with their descriptions

2006 Achievement Test Questions

The questions presented in this document are from the previously secured 2006 Grade 9 Science Achievement Test and are representative of the questions that form achievement tests. These questions are released by Alberta Education for teacher and student use.

Grade 9 Achievement Test

2006

Science

Use the following information to answer question 4.

Characteristics of an Unknown Organism

- Has its niche at the surface of the soil
- Uses water and minerals from the soil
- Supplies food and oxygen to other organisms

4. Given the characteristics listed above, the unknown organism could be a
- A. clover
 - B. mushroom
 - C. virus
 - D. worm
-

Use the following information to answer question 5.

Reproductive Characteristics of a Particular Species

- Able to reproduce once a year only
- Able to produce two offspring each time it reproduces
- Genetic information transferred to the offspring during reproduction
- One or two zygotes formed in the reproductive process

5. Which of the following statements correctly describes the reproductive process of this species?
- A. Reproduction is sexual because genetic information is transferred to the offspring only from the female.
 - B. Reproduction is sexual because a zygote is formed.
 - C. Reproduction is asexual because few offspring are produced at one time.
 - D. Reproduction is asexual because the species might only have an offspring every six months.

Use the following information to answer question 8.

Information About Malaria

- Malaria, a serious disease, is caused by a parasite that is spread by the bite of an infected mosquito.
- People travelling in areas where there is a high risk of contracting malaria used to be prescribed chloroquine pills to prevent the disease.
- Now, other treatments are usually prescribed because chloroquine is no longer guaranteed to be effective.

8. The **most probable** reason that chloroquine is less effective than it used to be in preventing the onset of malaria is that
- A. malaria parasites have developed a resistance to chloroquine
 - B. mosquitoes have developed a resistance to the malaria parasite
 - C. people have developed a resistance to chloroquine
 - D. people have developed a resistance to the malaria parasite
-

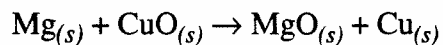
Use the following information to answer question 9.

Statements About Different Species

- | | |
|----------------------|--|
| Statement I | Passenger pigeons were overhunted. |
| Statement II | Grizzly bears are no longer found in Mexico. |
| Statement III | Panda bears rely mainly on one food source. |
| Statement IV | Northern cod stocks off the coast of Newfoundland have been reduced. |

9. Which of the statements above describes a species that has undergone extirpation?
- A. I
 - B. II
 - C. III
 - D. IV

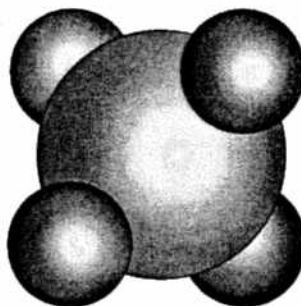
Use the following equation to answer question 11.



11. Which of the following word equations correctly restates the equation above?
- A. Magnesium + copper \rightarrow magnesium oxide + copper(II) oxide
 - B. Magnesium + copper \rightarrow magnesium oxide + oxide copper(II)
 - C. Magnesium + copper(II) oxide \rightarrow magnesium oxide + copper
 - D. Magnesium + oxide copper(II) \rightarrow magnesium oxide + copper
-

Use the following diagram to answer question 12.

Carbon Tetrahydride (Methane)



12. The chemical formula for the molecular compound shown above is
- A. C_4H
 - B. CH_4
 - C. C_4H_3
 - D. C_3H_4

Use the following excerpt from the periodic table to answer questions 15 to 18.

1 1.01 1+1- H hydrogen											2 4.00 He helium				
3 6.94 1+ Li lithium	4 9.01 2+ Be beryllium	5 10.81 B boron	6 12.01 C carbon	7 14.01 3- N nitrogen	8 16.00 2- O oxygen	9 19.00 1- F fluorine	10 20.18 Ne neon	11 22.99 1+ Na sodium	12 24.31 2+ Mg magnesium	13 26.98 3+ Al aluminium	14 28.09 Si silicon	15 30.97 3- P phosphorus	16 32.07 2- S sulfur	17 35.45 1- Cl chlorine	18 39.95 Ar argon

Legend for Elements

Solid	Gas
-------	-----

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

Key

Atomic number	3	6.94	Atomic molar mass
		1+	Common ion charges (most common first)
Symbol	Li		
			Name
			lithium

15. Which of the following statements presents correct information about an element in the excerpt from the periodic table shown above?
- Fluorine atoms can have 6 protons.
 - Carbon atoms can have 20 protons.
 - Sodium atoms can have 16 protons.
 - Phosphorus atoms can have 15 protons.
16. Which of the following elements is the least reactive?
- Chlorine
 - Sodium
 - Argon
 - Boron
17. When solid LiF is added to water, the resulting solution is
- molecular and does not conduct electricity
 - ionic and does not conduct electricity
 - molecular and conducts electricity
 - ionic and conducts electricity

Use the following information to answer question 20.

In an experiment, a student immerses four nails composed of different metals in a dilute corrosive solution. Each nail has the same surface area. The student measures the mass of each nail before the experiment and then again after the nail has been immersed in the corrosive solution for 20 minutes. The results are recorded in the table below.

Type of Metal Nail	Mass of Nail (g)	
	Before	After
Metal W	1.1	0.6
Metal X	1.3	0.7
Metal Y	1.5	1.2
Metal Z	1.8	1.4

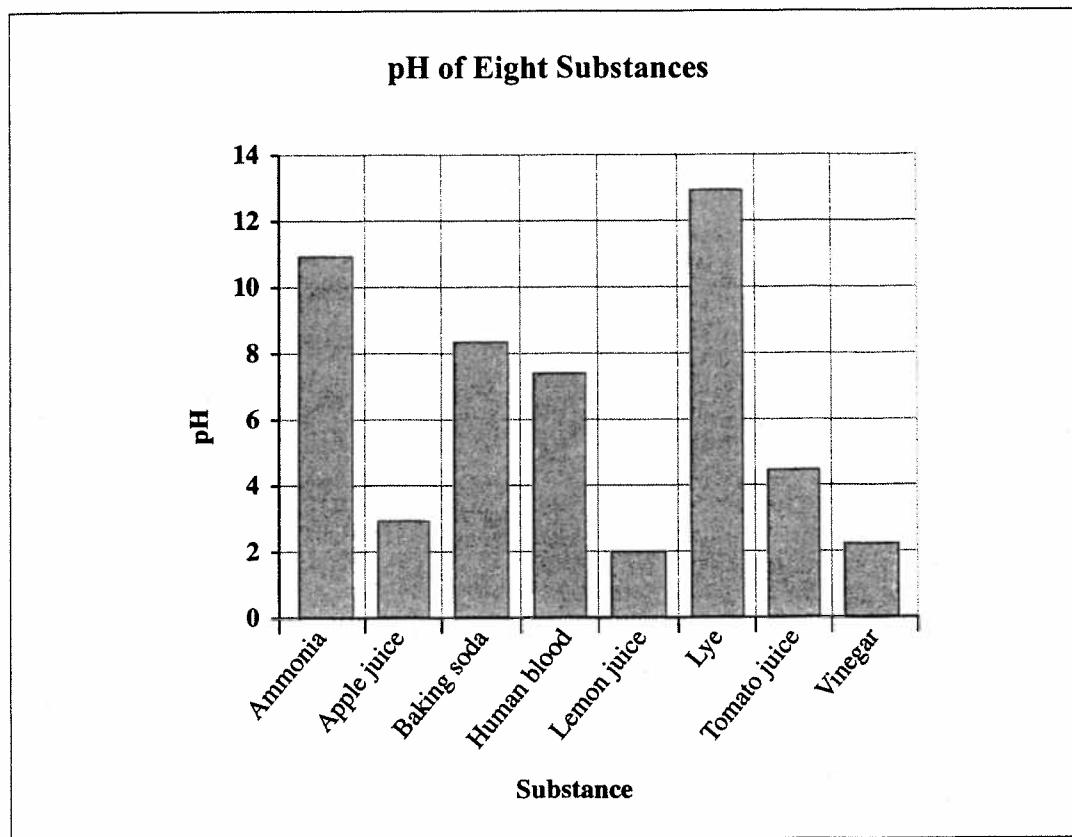
20. According to the information above, the metal that would react **most readily** to a dilute corrosive solution is
- A. Metal W
 - B. Metal X
 - C. Metal Y
 - D. Metal Z
-

Use the following information to answer question 21.

A researcher hypothesized that ultraviolet radiation prevents pigeon eggs from hatching. To test this hypothesis, the researcher divided fertilized pigeon eggs into six groups. During incubation, five of the groups were exposed to different intensities of ultraviolet radiation for 24 hours, but the sixth group was not. The number of eggs that hatched in each group was recorded.

21. What is the responding variable in this experiment?
- A. Intensity of ultraviolet radiation
 - B. Amount of time exposed to ultraviolet radiation
 - C. Group of eggs not exposed to ultraviolet radiation
 - D. Number of eggs that hatched after exposure to ultraviolet radiation

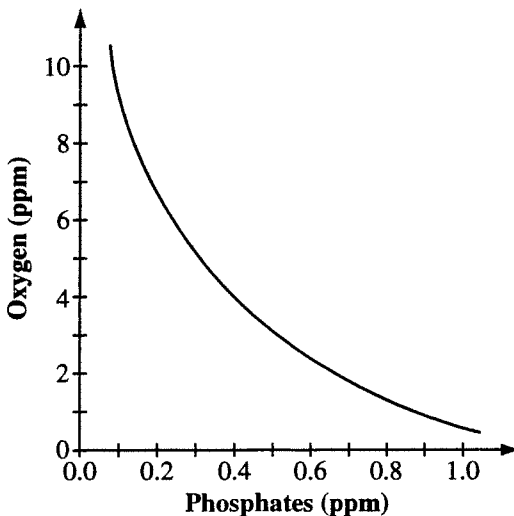
Use the following graph to answer question 23.



23. Which of the following conclusions can be made from the graph above?
- A. Vinegar is more basic than lye.
 - B. Ammonia is more acidic than apple juice.
 - C. Baking soda is more basic than human blood.
 - D. Tomato juice is more acidic than lemon juice.
-
24. Which of the following statements describes one characteristic shared by **all** biodegradable substances?
- A. They can be broken down by inorganic compounds.
 - B. They can be broken down by simple organisms.
 - C. They decompose faster at low temperatures.
 - D. They decompose faster in dry conditions.

Use the following information to answer questions 27 and 28.

The Relationship Between the Concentrations of Oxygen and Phosphates in a Particular Pond



Minimum O₂ Concentrations Within Which Invertebrates Can Survive	
O₂ Concentration (ppm)	Invertebrates
8–10	Stonefly nymph
4–8	Dragonfly nymph
0–4	Midge larvae

27. Which of the following statements describes the relationship between oxygen concentration and phosphate concentration that is illustrated in the graph?
- A. As oxygen levels increase, phosphate levels increase.
 - B. As oxygen levels increase, phosphate levels stay the same.
 - C. As phosphate levels increase, oxygen levels decrease.
 - D. As phosphate levels increase, oxygen levels stay the same.

Numerical Response

3. For each of the substances listed below, indicate whether it is organic or inorganic using the following code.

1 = Organic

2 = Inorganic

Potassium

Magnesium

Carbohydrate

Salt

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

31. The most common type of energy loss in electrical devices is
- A. thermal
 - B. potential
 - C. chemical
 - D. mechanical

Use the following information to answer question 32.

A ride in an amusement park is controlled by an operator who turns a dial to make the seats rotate faster. As the operator turns the dial, more current flows to the motors.

32. Which of the following electrical devices causes the seats on the amusement park ride to rotate faster?
- A. Variable resistor
 - B. Circuit breaker
 - C. Generator
 - D. Ammeter

Use the following information to answer question 35.

Four Electrical Circuits

Circuit 1	1 battery, 3 light bulbs wired in series
Circuit 2	1 battery, 5 light bulbs wired in series
Circuit 3	1 battery, 3 light bulbs wired in parallel
Circuit 4	1 battery, 5 light bulbs wired in parallel

All of the light bulbs and batteries are identical.

35. When connected, which of the electrical circuits described above will result in the dimmest light?
- A. Circuit 1
 - B. Circuit 2
 - C. Circuit 3
 - D. Circuit 4
-

36. Which of the following rows identifies the correct circuit distance, amperage, resistance, and control device of a working microelectronic circuit?

Row	Circuit Distance	Amperage	Resistance	Control Device
A.	Short	Low	Low	Transistor
B.	Short	High	High	Transistor
C.	Long	Low	Low	Switch
D.	Long	High	High	Switch

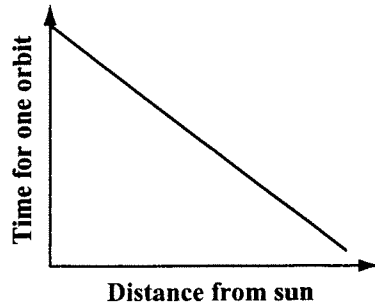
37. Which of the following parts of a lead storage car battery is acidic?
- A. Electrode
 - B. Electrolyte
 - C. Positive terminal
 - D. Negative terminal

39. QUESTION 39 IS STILL SECURED AND WILL NOT BE RELEASED

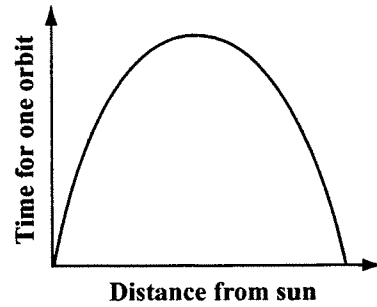
40. Which of the following actions will **not** reduce the energy used?
- A. Adding a layer of insulation to your refrigerator
 - B. Replacing incandescent bulbs with fluorescent bulbs
 - C. Washing clothes in cold water rather than in hot water
 - D. Watching television in the afternoon rather than in the early evening
-

43. Which of the following graphs correctly represents the relationship between the orbit times of planets and their distance from the sun?

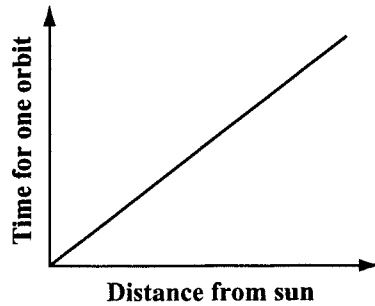
A.



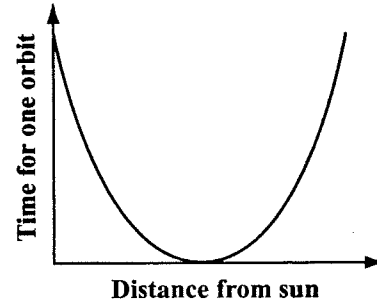
B.



C.



D.



44. Mars is visible on a clear night because it

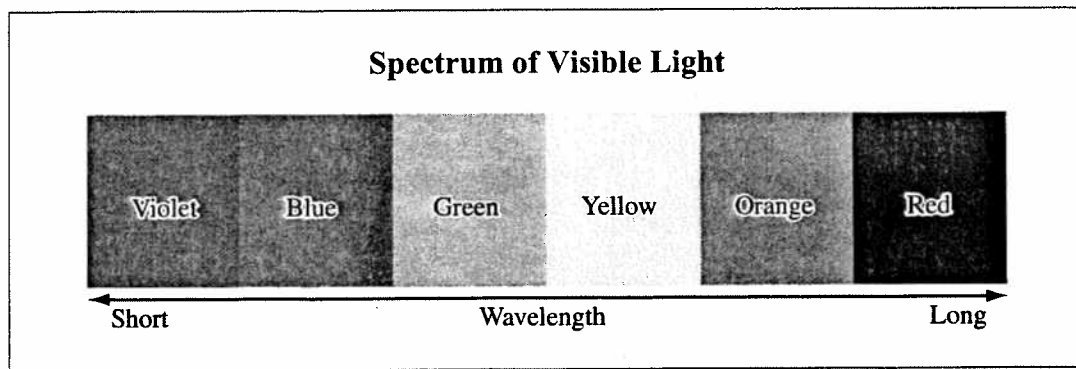
- A. reflects light
- B. refracts light
- C. absorbs light
- D. produces light

45. Triangulation is the measurement process that astronomers use to estimate the

- A. size of a celestial body
- B. orbit of a celestial body
- C. distance to a celestial body from Earth
- D. angle between a celestial body and Earth

48. For a particular satellite to provide an uninterrupted television signal to a particular viewer 24 hours a day and seven days a week, it must
- A. travel in a low Earth orbit
 - B. travel in a geosynchronous orbit
 - C. be a remote-sensing satellite
 - D. be a Global Positioning System satellite
49. Most of the outer planets of our solar system are
- A. gaseous, small, and have few moons
 - B. gaseous, large, and have many moons
 - C. terrestrial, small, and have few moons
 - D. terrestrial, large, and have many moons

Use the following diagram to answer question 50.



50. Which of the following descriptions identifies a red-shifted star?
- A. A star that is larger than Earth
 - B. A star that is smaller than Earth
 - C. A star that is moving toward Earth
 - D. A star that is moving away from Earth

