

Released 2010
Achievement Test

Science

GRADE
9



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This document contains a full release of test items from the 2010 [Grade 9 Science Achievement Test](#).

A test blueprint and an answer key that includes the difficulty, reporting category, topic, and item description for each test item will also be included. These materials, along with the [Program of Studies](#) and [subject bulletin](#), provide information that can be used to inform instructional practice.

[Assessment highlights reports](#) for all achievement test subjects and grades will be **posted on the [Alberta Education](#) website every year** in the fall

Assessment highlights provide information about the overall test, the test blueprints, and student performance on the 2011 Grade 9 Science Achievement Test. Also provided is commentary on student performance at the acceptable standard and the standard of excellence on selected items from the 2011 Achievement test. This information is intended for teachers and is best used in conjunction with the multi-year and detailed school reports that are available to schools via the extranet.

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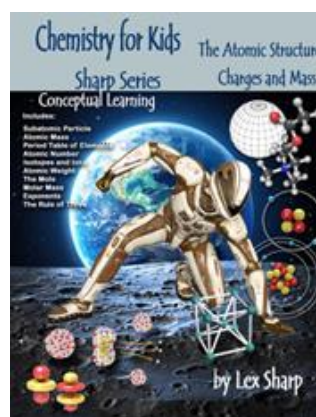
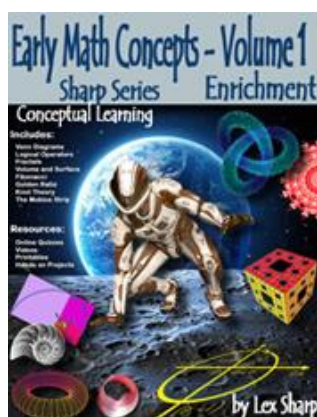
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2010 Achievement Test Questions

The questions presented in this document are from the previously secured 2010 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

2010

Science

Use the following information to answer question 1.

Some Causes of Species Extinction

- I** Disease
- II** Overharvesting
- III** Loss of habitat
- IV** Natural disasters

1. Which causes of species extinction are **most directly** related to human activities?

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

2. A benefit of asexual reproduction is that it

- A. produces many offspring
- B. increases genetic diversity
- C. increases species diversity
- D. requires specialized structures

Use the following information to answer question 3.

Information About Army Cutworm Larvae

- Army cutworm larvae eat the foliage of many commercial crops (e.g., wheat, alfalfa).
- Army cutworm larvae feed from April to the end of May, at which time they develop into moths.
- A tiny wasp (*Copidosoma*) parasitizes army cutworm larvae by laying a single egg in a larva.
- Army cutworm larvae that are parasitized remain in the larval stage longer than those that are not parasitized.

3. If the population of *Copidosoma* is large, then the quality of wheat crops will
- A. increase, because there will be fewer larvae to feed on the crops
 - B. decrease, because there will be fewer larvae to feed on the crops
 - C. increase, because larvae will feed on the crops for a longer time
 - D. decrease, because larvae will feed on the crops for a longer time
-

Use the following information to answer question 4.

Labrador retrievers have 78 chromosomes in each of their muscle cells.

4. Which biological process ensures that a male Labrador retriever's sperm cells will each have 39 chromosomes?
- A. Mitosis
 - B. Meiosis
 - C. Selective breeding
 - D. Artificial selection

Use the following information to answer numerical-response question 1.

Newspaper Headlines

- 1 “Animal Trafficking—Can It Be Stopped?”
- 2 “Banff National Park Celebrates Anniversary”
- 3 “Baby Elephant Born at City Zoo”
- 4 “Disease Destroys Rare Plant Species”

Numerical Response

1. Match each of the newspaper headlines numbered above with the conservation strategy to which it **best** relates.

Captive breeding programs _____ (Record in the **first** column)
Establishment of seed banks _____ (Record in the **second** column)
Designation of protected areas _____ (Record in the **third** column)
Development of international treaties _____ (Record in the **fourth** column)

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

Use the following information to answer question 5.

Physical Adaptations Observed in Four Organisms

I	Durum wheat is high in protein and gluten, which makes it suitable for use in pasta and bread.
II	The beak of a golden eagle is sharp and strong, which makes it useful for ripping and tearing meat.
III	The broad leaves on a maple tree make it efficient at gathering sunlight for photosynthesis.
IV	Wolves have large ridges of bone on the back of their skulls that allow the anchoring of strong jaw muscles.

5. Which physical adaptation is a result of artificial selection?

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

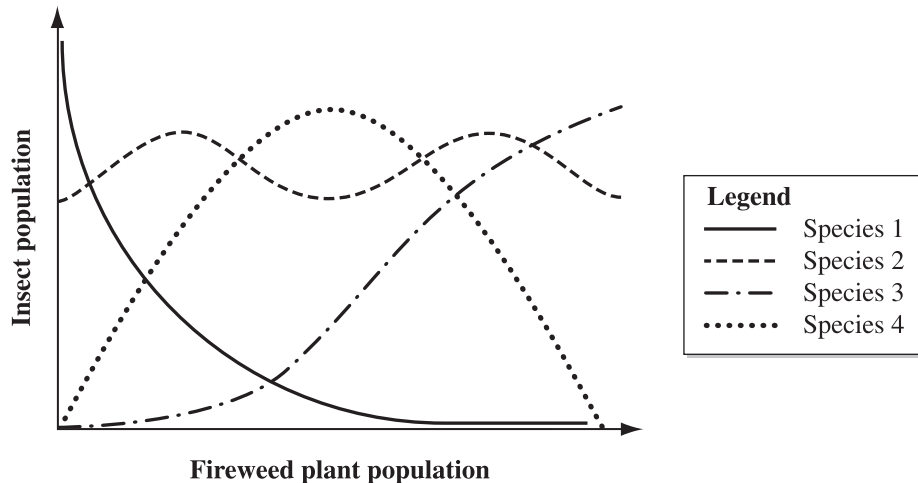
Use the following information to answer question 6.

Gregor Mendel, an Austrian monk, experimented with pea plants. He observed that when a plant that produced round seeds was mated with a plant that produced wrinkled seeds, the resulting offspring produced only round seeds.

6. A conclusion that can be drawn from Mendel's experiment is that the wrinkled-seed trait is
- A. dominant and no longer part of the offspring's DNA
 - B. recessive and no longer part of the offspring's DNA
 - C. dominant and still part of the offspring's DNA
 - D. recessive and still part of the offspring's DNA

Use the following information to answer question 7.

Four species of insects consume nectar from fireweed plants as a component of their diet. The graph below shows the relationship between the population of each of the four insect species and the population of fireweed plants in a test area.



7. An inference that can be made from the graph above is that the insect species with the broadest niche is **most likely** species
- A. 1
 - B. 2
 - C. 3
 - D. 4

Use the following information to answer question 8.

Examples of Variation in Alberta	
I	Unlike most other owl species, which prefer to nest in trees, burrowing owls nest underground.
II	A bull trout and a brook trout look quite similar, but a bull trout lacks black markings on its fins.
III	Some lodgepole pine trees grow branches near the top; some grow branches along the whole length of the tree.
IV	Grizzly bears can be distinguished from black bears by their broad, round faces and the large humps of muscle on their shoulders.

8. Variation within a species is demonstrated by example

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

9. Which of the following heritable human traits **cannot** be influenced by the environment?

- A. Height
- B. Weight
- C. Skin colour
- D. Earlobe attachment

Use the following information to answer question 10.

Organism	Number of Chromosomes in a Body Cell	Number of Chromosomes in a Gamete	Number of Chromosomes in a Zygote
Earthworm	36	Y	36
Wheat	X	21	42
Cow	60	30	Z

10. Which of the following rows identifies the values of X, Y, and Z?

Row	X	Y	Z
A.	21	18	30
B.	21	36	30
C.	42	18	60
D.	42	36	60

Use the following information to answer question 11.

During a laboratory experiment, four students each combined two substances and recorded their observations.

Student	Substance I	Substance II	Substances I and II Combined
1	White solid	Clear liquid	Clear liquid that remains at a temperature of 15 °C
2	Clear liquid	Blue solid	Blue liquid
3	White solid	Clear liquid	Clear liquid that bubbles
4	Yellow liquid	White solid	White solid that floats on top of the yellow liquid

11. Which student **most likely** produced a new chemical substance?

- A. Student 1
 - B. Student 2
 - C. Student 3
 - D. Student 4
-

12. Which of the following rows identifies both the elements and the total number of atoms that are present in one molecule of $\text{CH}_3\text{COOH}(\text{aq})$?

Row	Elements	Total Number of Atoms
A.	Carbon, helium, and oxygen	3
B.	Carbon, helium, and oxygen	8
C.	Carbon, hydrogen, and oxygen	3
D.	Carbon, hydrogen, and oxygen	8

Use the following information to answer questions 13 to 15.

Periodic Table of the First Eighteen Elements															
11.01 1+, 1- H hydrogen												4.00 He helium			
36.94 1+ Li lithium		9.01 2+ Be beryllium		510.81 B boron		612.01 C carbon		714.01 3- N nitrogen		816.00 2- O oxygen		919.00 1- F fluorine		1020.18 Ne neon	
1122.99 1+ Na sodium		1224.31 2+ Mg magnesium		1326.98 3+ Al aluminum		1428.09 Si silicon		1530.97 3- P phosphorus		1632.07 2- S sulfur		1735.45 1- Cl chlorine		1839.95 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

13. The number of electrons in one beryllium atom is
- 9
 - 5
 - 4
 - 2
14. Which of the following pairs of elements have the most properties in common?
- Fluorine and oxygen
 - Fluorine and chlorine
 - Sodium and neon
 - Sodium and magnesium

15. When sodium and chlorine react, *i* compound is formed that *ii* conduct electricity when dissolved in water.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	a molecular	will
B.	a molecular	will not
C.	an ionic	will
D.	an ionic	will not

16. Which of the following statements describes a physical property of a substance?
- A. Hydrochloric acid produces heat when mixed with zinc.
 - B. Phosphorous burns when exposed to air.
 - C. Lithium reacts violently with water.
 - D. Copper conducts electricity.

Use the following information to answer question 17.

Rutherford used the solar system as a model to explain the structure of an atom.

17. When this model is compared to an atom, the planets represent the
- A. protons
 - B. nucleus
 - C. neutrons
 - D. electrons

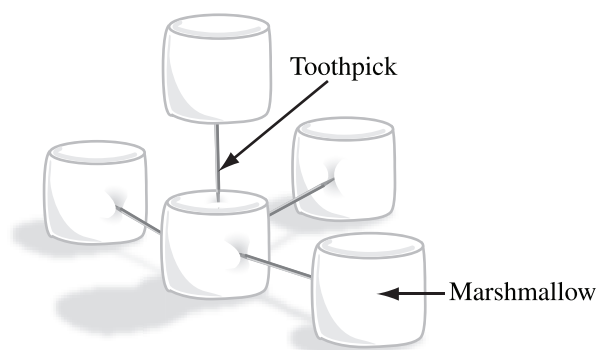
18. The process of metal corrosion slows down if a metal is kept *i* and *ii* .

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	dry	cool
B.	dry	warm
C.	moist	cool
D.	moist	warm

Use the following information to answer question 19.

Tim created the following molecular model using toothpicks and marshmallows.



19. Which of the following chemical formulas could the model represent?

- A. H_2
- B. CH_4
- C. H_2O
- D. NH_3

Use the following information to answer question 20.

A group of students conducts an experiment to determine the effect of temperature on reaction rates. They perform three separate trials in this experiment. In the first trial, they drop an antacid tablet into a beaker of water at a temperature of 40 °C and record how long it takes the tablet to completely dissolve. In the second and third trials, they use the same type and amount of antacid, but they change the temperature of the water to 25 °C for the second trial and 5 °C for the third trial.

20. The manipulated variable in this experiment is the

- A. type of antacid used
 - B. amount of antacid used
 - C. time it takes for the reaction to occur
 - D. temperature at which the reaction occurs
- _____

Use the data sheet to answer numerical-response question 2.

Numerical Response

2. For each of the elements given below, indicate whether it is a metal or non-metal using the following code.

1 = Metal

2 = Non-metal

Aluminum

Fluorine

Lithium

Phosphorus

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

21. Which of the following roles is played by carbohydrates in human nutrition?

- A. Act as an energy source
- B. Assist enzyme function
- C. Storage form of unused chemical energy
- D. Structural component of cells in the body

Use the following information to answer question 22.

Bromothymol blue is an indicator that changes colour at different pH levels.

pH	Colour
Above 7.6	Blue
6 – 7.6	Green
Below 6	Yellow

22. Bromothymol blue will appear yellow when mixed with

- A. lemon juice
 - B. baking soda
 - C. drain cleaner
 - D. distilled water
-

Use the following information to answer question 23.

Some electric power plants use water pumped in from rivers to absorb the excess heat they produce. This warm water is then returned to the river.

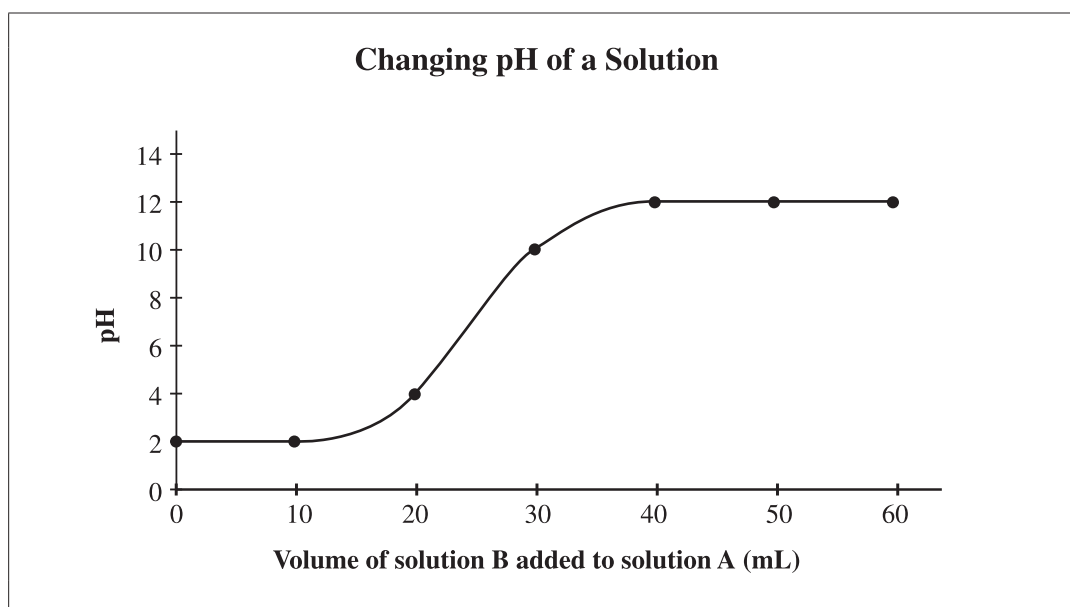
23. Which of the following rows describes what can happen to the oxygen concentration and the variety of organisms at the point in the river where the warm water is returned?

Row	Oxygen Concentration	Variety of Organisms
A.	Increases	Increases
B.	Increases	Decreases
C.	Decreases	Decreases
D.	Decreases	Increases

24. The presence of a species of large trout in a particular lake indicates a

- A. high dissolved oxygen concentration
- B. low dissolved oxygen concentration
- C. high water temperature
- D. low water pH

Use the following information to answer question 25.



25. What volume of solution B must be used to neutralize solution A?

- A. 15 mL
 - B. 25 mL
 - C. 35 mL
 - D. 45 mL
-

Use the following information to answer question 26.

Algae growth typically increases in polluted lakes.

26. The chemicals that are **most likely** responsible for increases in algae growth in lakes are

- A. oxygen and carbon dioxide
- B. nitrates and carbon dioxide
- C. oxygen and phosphates
- D. nitrates and phosphates

Use the following information to answer question 27.

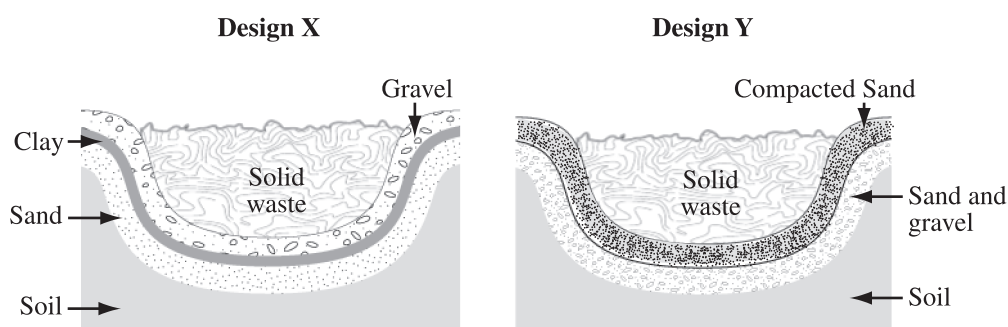
The carcass of a whooping crane was found along the shore of a lake. It was examined, and high levels of pesticide were found in its tissue.

Fish of various species were then collected from the lake, and they were found to have moderate levels of pesticide in their tissues.

27. Which of the following statements **best** explains the high levels of pesticide in the whooping crane?
- A. The whooping crane's skin absorbed the pesticide.
 - B. The whooping crane swam in contaminated lake water.
 - C. The whooping crane fed on pesticide-treated grass near the lake.
 - D. The whooping crane's primary food source was the fish from the lake.

Use the following information to answer question 28.

The following diagrams show two proposed designs for a new landfill.



28. Design *i* should be selected as the design for the new landfill, because the *ii* layer prevents chemical leaching.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	X	gravel
B.	X	clay
C.	Y	sand and gravel
D.	Y	compacted sand

Use the following information to answer question 29.

The diversity of the mayfly decreases as stream habitat quality declines.

- 29.** Considering the information above, a study of the mayfly can be useful to scientists, since it is a
- A.** species influenced by biomagnification
 - B.** species influenced by predation
 - C.** tolerant invertebrate species
 - D.** biological indicator species
-

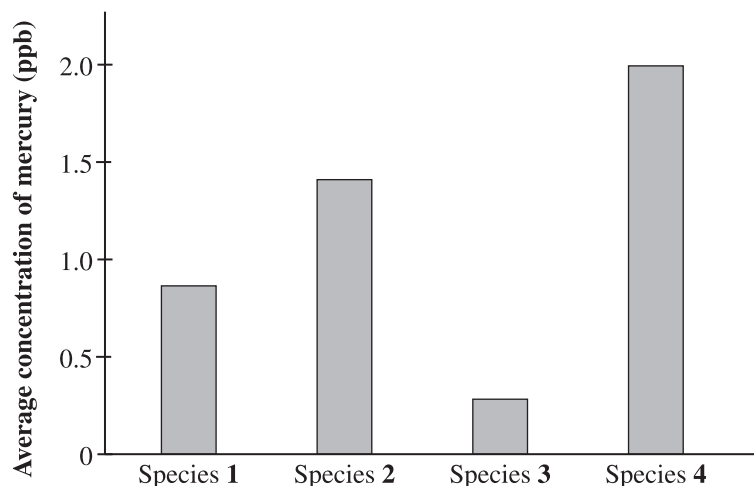
Use the following information to answer question 30.

The dissolved oxygen concentration of a pond is 8 ppm by volume.

- 30.** This level of dissolved oxygen indicates that 8 mL of oxygen is found in
- A.** 1 000 000 mL of water
 - B.** 10 000 mL of water
 - C.** 1 000 mL of water
 - D.** 100 mL of water

Use the following information to answer numerical-response question 3.

A biologist studies the concentration of mercury in the livers of four species that are in the same food chain. She records her findings in the graph below.



Numerical Response

3. When listed in order from the species that is first in the food chain to the species that is last in the food chain, the species are _____, _____, _____, and _____.
First **Last**

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

Use the following information to answer question 31.

Facts About Electricity

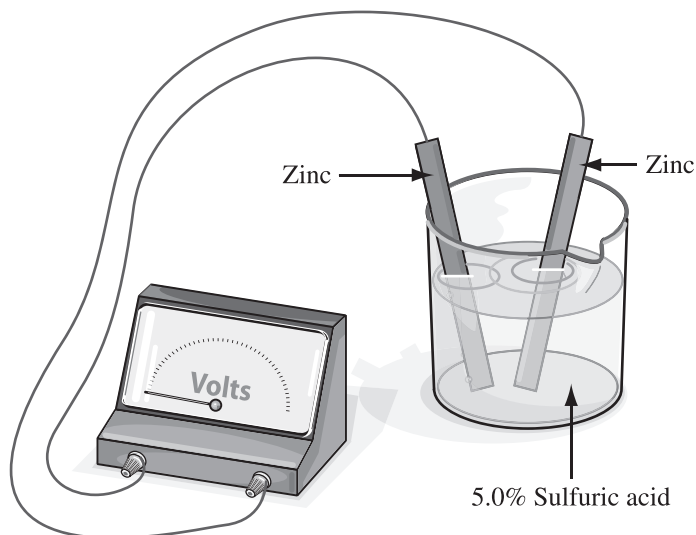
- I** Electrons can be discharged when clothes are removed from a clothes dryer.
- II** Electrons flow continuously through a conductor.
- III** Electricity can be used to operate a motor.
- IV** Electricity can build up and produce lightning.

31. Which facts describe properties of static electricity?

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

Use the following information to answer question 32.

After assembling the wet cell shown below, Roger noticed that no electricity was produced.



32. Which change could Roger make to the wet cell to produce electricity?
- A. Replace one of the zinc electrodes with copper.
 - B. Increase the sulfuric acid concentration to 7.5%.
 - C. Replace both of the zinc electrodes with copper.
 - D. Decrease the sulfuric acid concentration to 2.5%.
-
33. Which of the following sequences shows the transfer of energy initiated by the flow of water in a hydroelectric power plant?
- A. Mechanical–gravitational–electrical
 - B. Electrical–gravitational–mechanical
 - C. Gravitational–electrical–mechanical
 - D. Gravitational–mechanical–electrical

34. Which of the following sets of components in a series circuit would cause the light bulbs to shine the brightest?

Row	Resistance	Load
A.	Resistor present	2 bulbs
B.	Resistor present	3 bulbs
C.	No resistor present	2 bulbs
D.	No resistor present	3 bulbs

Use the following information to answer question 35.

A student explains how electric circuits function by comparing them to a traffic model. Some of the components of traffic are listed below.

Traffic Components

- I** Road construction sites
- II** Stop signs
- III** Vehicles
- IV** Roads

35. Which component of the traffic model is **most closely** related to switches found in circuits?

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

Use the data sheet to answer numerical-response question 4.

Kelly recorded the input energy and output energy of four electric devices.

Device	Input Energy (J)	Output Energy (J)
1	10	3
2	71	16
3	100	27
4	950	510

Numerical Response

4. When listed in order from the **most** efficient device to the **least** efficient device, the order is

_____, _____, _____, and _____.

**Most
efficient**

**Least
efficient**

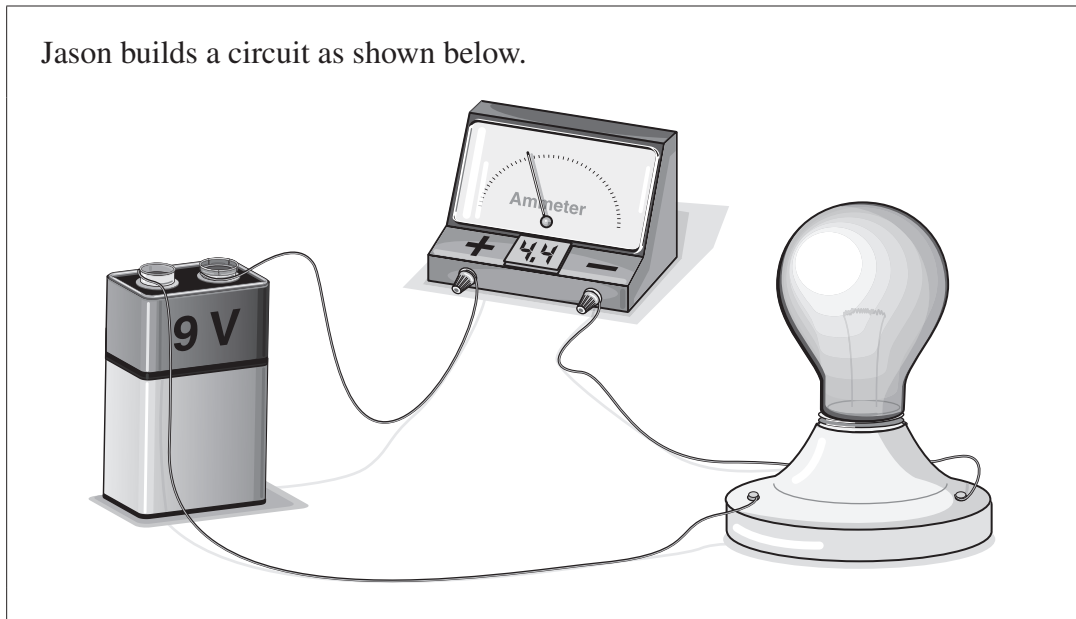
(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

36. Which of the following sources of energy is classified as renewable?

- A. Natural gas
- B. Biomass
- C. Coal
- D. Oil

Use the following information to answer question 37.

Jason builds a circuit as shown below.



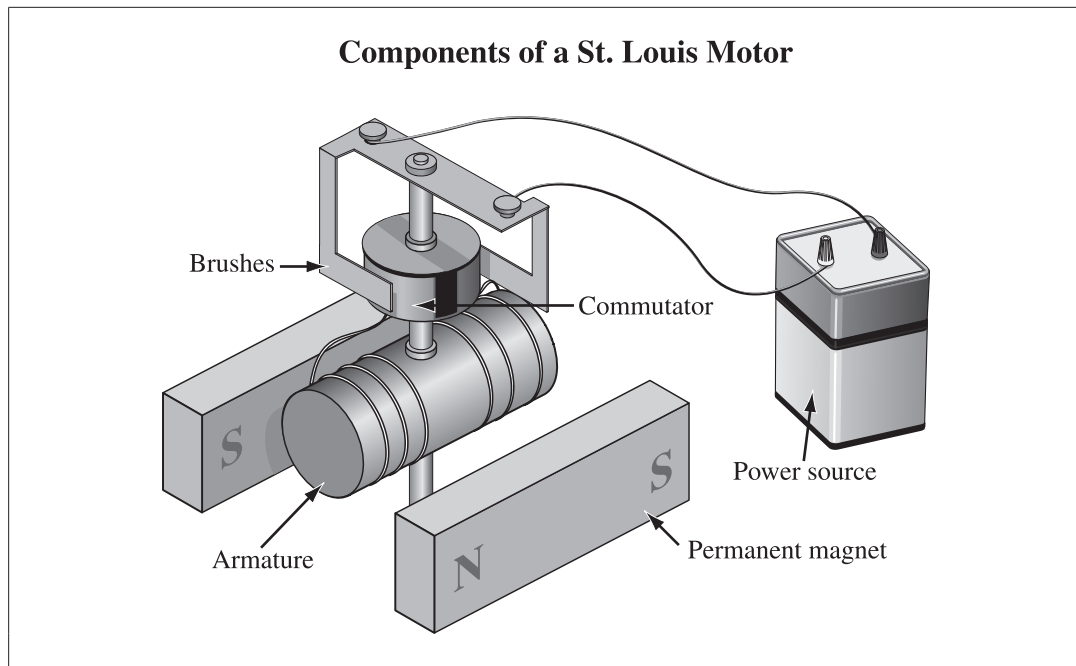
37. To the nearest tenth of a watt, how much power does the bulb consume ($P = IV$)?

- A. 0.5 W
 - B. 2.0 W
 - C. 13.4 W
 - D. 39.6 W
-

38. A disadvantage of hydroelectric power generation is that it

- A. emits pollutants into the atmosphere
- B. disrupts the natural flow of waterways
- C. provides an unreliable method for producing energy
- D. produces hazardous waste that requires long-term storage

Use the following information to answer question 39.



39. Which motor component functions as an electromagnet?
- A. Permanent magnet
 - B. Power source
 - C. Commutator
 - D. Armature
-
40. An electrical device with low efficiency is **most likely** to produce excess
- A. heat energy
 - B. light energy
 - C. sound energy
 - D. mechanical energy

41. The chart that contrasts the geocentric model of the solar system with the current heliocentric model is

A.

Geocentric Model	Current Heliocentric Model
• Planets orbit the Sun	• Planets orbit Earth
• Orbits are circular in shape	• Orbits are elliptical in shape

B.

Geocentric Model	Current Heliocentric Model
• Planets orbit the Sun	• Planets orbit Earth
• Orbits are elliptical in shape	• Orbits are circular in shape

C.

Geocentric Model	Current Heliocentric Model
• Planets orbit Earth	• Planets orbit the Sun
• Orbits are circular in shape	• Orbits are elliptical in shape

D.

Geocentric Model	Current Heliocentric Model
• Planets orbit Earth	• Planets orbit the Sun
• Orbits are elliptical in shape	• Orbits are circular in shape

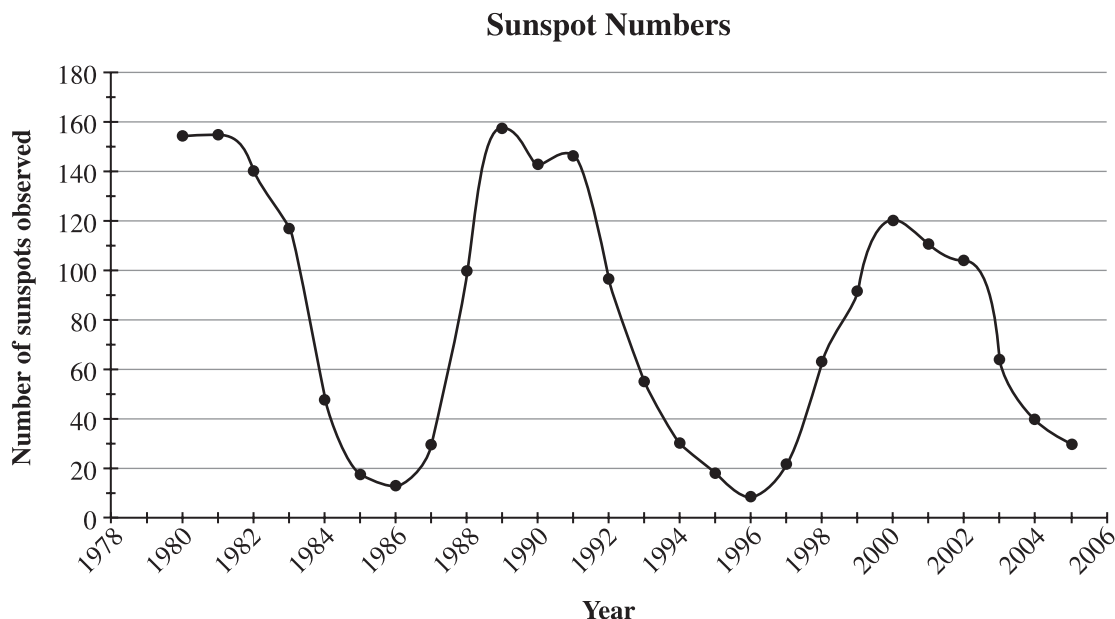
42. A *i* consists of stars, planets, and dust, which are formed from a *ii* .

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	constellation	nebula
B.	nebula	galaxy
C.	galaxy	nebula
D.	galaxy	constellation

Use the following information to answer question 43.

Sunspots are associated with solar flares and coronal mass ejections (CMEs). The number of sunspots alternates between periods of high numbers (solar maximum) and periods of low numbers (solar minimum).



—Data obtained from the *National Geophysical Data Center*

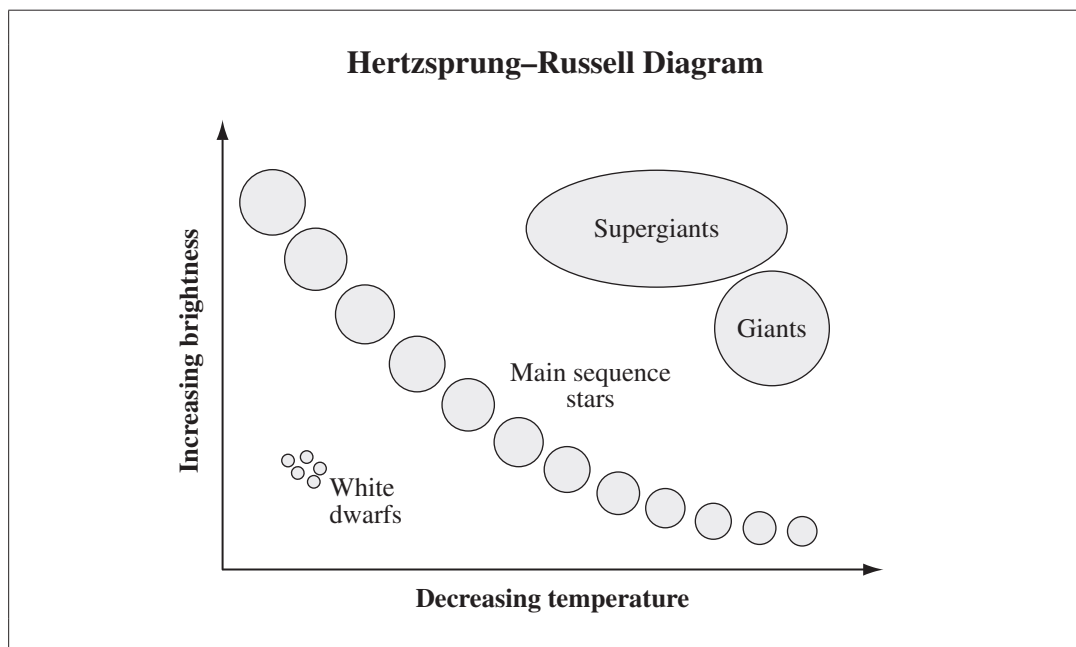
43. In the year 2011, there will **most likely** be ____ *i* ____ in CMEs associated with a solar ____ *ii* ____.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	an increase	maximum
B.	an increase	minimum
C.	a decrease	maximum
D.	a decrease	minimum

44. Parallax and triangulation can be used to determine the
- A. distance between a star and a planet
 - B. magnitude of a star's brightness
 - C. speed a planet is orbiting a star
 - D. composition of a star or planet
45. Which of the following technologies provides the **least** information about celestial bodies in our solar system?
- A. Telescope
 - B. Interferometry
 - C. Spectral analysis
 - D. Global Positioning System

Use the following information to answer question 46.



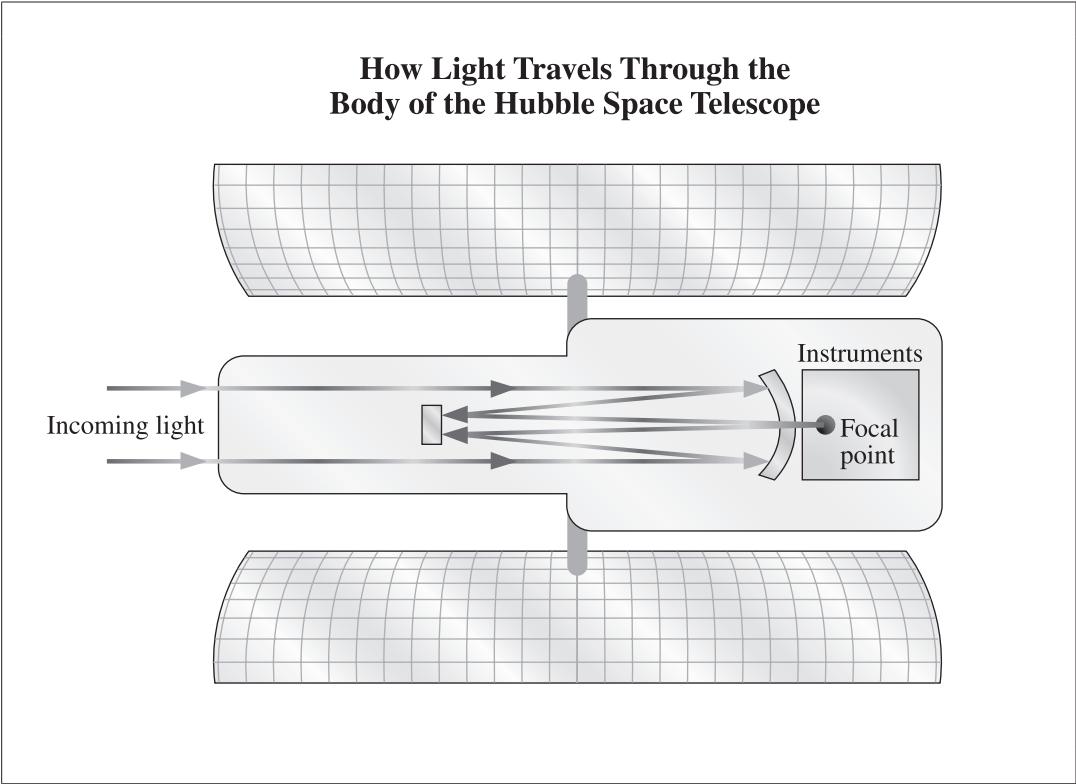
46. When compared with a giant star, a white dwarf star is
- A. brighter and hotter
 - B. brighter and colder
 - C. dimmer and hotter
 - D. dimmer and colder

Use the following illustration to answer question 47.



47. What is the student in the illustration above **most likely** trying to determine?
- A. The altitude of the sphere
 - B. The azimuth of the sphere
 - C. The distance to the sphere
 - D. The diameter of the sphere

Use the following information to answer question 48.



48. The Hubble Space Telescope uses *i* to *ii* the light into the focal point.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	lenses	reflect
B.	lenses	refract
C.	mirrors	reflect
D.	mirrors	refract

Use the following information to answer question 49.

Information about Jupiter

Length of year = 142 Earth months

Length of day = 10 Earth hours

49. Jupiter spins on its axis *i* than Earth does, and it has an orbit that is *ii* than Earth's.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	slower	larger
B.	slower	smaller
C.	faster	larger
D.	faster	smaller

Use the following information to answer numerical-response question 5.

Over time, several technologies have been developed to study and explore space.

Technologies

- 1 Shuttle
- 2 Radio telescope
- 3 Probe

Numerical Response

5. Match each of the technologies numbered above with its description given below.

Designed to detect
low-frequency energy from space _____ (Record in the **first** column)

Designed to explore
celestial bodies beyond the Moon _____ (Record in the **second** column)

Designed to transport
equipment to the International Space Station _____ (Record in the **third** column)

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

Use the following information to answer question 50.

The year 2020 is the target date for the creation of a base on the Moon.



Speaker I

How much will establishing this base on the moon cost?

If nuclear reactors are used for power, then how will the waste be disposed of?



Speaker II

Who gets to determine how the resources on the moon are to be used and distributed?



Speaker III

How can we ensure that the moon base is used for peaceful initiatives?



Speaker IV

50. Which speaker's question reflects an environmental perspective?

- A. Speaker I
- B. Speaker II
- C. Speaker III
- D. Speaker IV

2010 Test Blueprint and Item Descriptions

The following blueprint shows the reporting categories and topics by which questions were classified on the 2010 Grade 9 Science Achievement Test.

Topic	Question Distribution by Reporting Category		Number (Percentage) of Questions
	Knowledge	Skills	
Biological Diversity	5 (1, 2, 4, NR1, 9)	6 (3, 5, 6, 7, 8, 10)	11 Questions (20% of Total Test)
Matter and Chemical Change	6 (12, 15, 16, 17, 18, NR2)	5 (11, 13, 14, 19, 20)	11 Questions (20% of Total Test)
Environmental Chemistry	4 (21, 24, 26, 29)	7 (22, 23, 25, 27, 28, 30, NR3)	11 Questions (20% of Total Test)
Electrical Principles and Technologies	4 (31, 33, 36, 40)	7 (32, 34, 35, NR4, 37, 38, 39)	11 Questions (20% of Total Test)
Space Exploration	5 (42, 44, 45, NR5, 50)	6 (41, 43, 46, 47, 48, 49)	11 Questions (20% of Total Test)
Number (Percentage) of Questions	24 Questions (45% of Total Test)	31 Questions (55% of Total Test)	Total Test 55 Questions (100%)

The table below provides information about each question on the 2010 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	Reporting Category	Key	Difficulty %	Topic	Item Description
1	Knowledge	C	80.4	Biological Diversity	Determine which causes of extinction are related to human activities
2	Knowledge	A	82.5	Biological Diversity	Recognize a benefit of asexual reproduction
3	Skills	D	51.8	Biological Diversity	Interpret the dependencies among three species
4	Knowledge	B	60.1	Biological Diversity	Recognize which biological process is responsible for determining the number chromosomes in a sperm cell
NR1	Knowledge	3421	62.8	Biological Diversity	Match four conservation strategies with the correct descriptions
5	Skills	A	70.8	Biological Diversity	Evaluate physical adaptations observed in four organisms and determine which is a result of artificial selection
6	Skills	D	59.8	Biological Diversity	Analyze the transmission of pea seed traits from parents to offspring and determine the pattern of inheritance
7	Skills	B	63.9	Biological Diversity	Analyze a graph of population size versus abundance of a food for four species to determine which has a broad niche
8	Skills	C	50.4	Biological Diversity	Analyze four examples of variation and determine which example demonstrates diversity within a species
9	Knowledge	D	81.0	Biological Diversity	Recall a heritable human trait that is not influenced by the environment
10	Skills	C	75.2	Biological Diversity	Using a chart, determine the number of chromosomes in a body, gamete, and zygote cell for three separate organisms
11	Skills	C	69.2	Matter & Chemical Change	Evaluate if a new substance has been produced in an experiment
12	Knowledge	D	70.1	Matter & Chemical Change	Determine the elements and number of atoms present in a molecular compound

Question	Reporting Category	Key	Difficulty %	Topic	Item Description
13	Skills	C	51.1	Matter & Chemical Change	Apply knowledge of the periodic table to identify the number of electrons in a particular element
14	Skills	B	57.1	Matter & Chemical Change	Apply knowledge of the periodic table to identify a pair of elements that have common properties
15	Knowledge	C	46.8	Matter & Chemical Change	Determine the classification of a compound and properties associated with that classification
16	Knowledge	D	64.0	Matter & Chemical Change	Select the characteristic that is an example of a physical property
17	Knowledge	D	60.7	Matter & Chemical Change	Compare the Rutherford model of the atom to a model of the solar system
18	Knowledge	A	67.0	Matter & Chemical Change	Identify storage conditions that are less favorable to the corrosion of metal
19	Skills	B	74.8	Matter & Chemical Change	Examine a molecular model to determine the correct chemical formula
20	Skills	D	81.6	Matter & Chemical Change	Determine the manipulated variable in an experiment
NR2	Knowledge	1212	47.0	Matter & Chemical Change	Apply knowledge of the periodic table to determine whether specific elements are metals or non-metals
21	Knowledge	A	69.7	Environmental Chemistry	Evaluate a list of roles of nutrients to determine which is carbohydrates
22	Skills	A	63.6	Environmental Chemistry	Determine the substance that would change an acid-base indicator to a certain color
23	Skills	C	54.9	Environmental Chemistry	Infer the resulting oxygen concentrations and variety of organisms in water with given characteristics
24	Knowledge	A	66.3	Environmental Chemistry	Conclude how the presence of aquatic organisms indicates water quality
25	Skills	B	63.2	Environmental Chemistry	Analyze a pH curve to determine the amount of base that must be added to neutralize an acidic solution

Question	Reporting Category	Key	Difficulty %	Topic	Item Description
26	Knowledge	D	52.3	Environmental Chemistry	Recognize the chemicals that are associated with increased algae growth in polluted lakes
27	Skills	D	78.5	Environmental Chemistry	Analyze a ecological event to provide a plausible reason for the death of an organism
28	Skills	B	77.6	Environmental Chemistry	Analyze two landfill designs and determine which site will prevent leaching
29	Knowledge	D	70.2	Environmental Chemistry	Identify a species role in determining water quality
30	Skills	A	63.3	Environmental Chemistry	Apply knowledge of parts per million units
NR3	Skills	3124	61.0	Environmental Chemistry	Arrange four species into a food chain based on a graph of toxin concentration versus species
31	Knowledge	B	77.1	Electrical Principals & Technologies	Identify two statements that describe static electricity
32	Skills	A	81.2	Electrical Principals & Technologies	Evaluate the construction of a wet cell and devise a strategy to increase the voltage produced
33	Knowledge	D	63.5	Electrical Principals & Technologies	Recognize the correct sequence of energy transfer in hydro-electric generation
34	Skills	C	73.5	Electrical Principals & Technologies	Identify components in a series circuit that affect light bulb brightness
35	Skills	B	73.5	Electrical Principals & Technologies	Using a city traffic model, relate the switch of a circuit to its applicable city traffic component
NR4	Skills	4132	52.1	Electrical Principals & Technologies	Calculate the efficiency of four devices and order them according to their efficiencies
36	Knowledge	B	66.5	Electrical Principals & Technologies	Identify a renewable source of electrical energy from a group of sources
37	Skills	D	74.3	Electrical Principals & Technologies	Calculate the power consumed by a simple circuit

Question	Reporting Category	Key	Difficulty %	Topic	Item Description
38	Skills	B	67.4	Electrical Principals & Technologies	Describe a negative impact of hydroelectric power generation
39	Skills	D	53.4	Electrical Principals & Technologies	Identify the part of a St. Louis motor that functions as an electromagnet
40	Knowledge	A	73.6	Electrical Principals & Technologies	Recognize a byproduct of low efficiency devices
41	Skills	C	70.3	Space Exploration	Identify differences between the geocentric and heliocentric models of the universe
42	Knowledge	C	71.5	Space Exploration	Recognize the composition of galaxies and what they originate from
43	Skills	A	59.6	Space Exploration	Predict future conditions associated with the sun given data presented in a line graph
44	Knowledge	A	81.8	Space Exploration	Recognize the use of parallax and triangulation
45	Knowledge	D	61.7	Space Exploration	Identify from a list a technology that has had the least impact on the study of space
46	Skills	C	48.2	Space Exploration	Analyze a Hertzsprung-Russell diagram to determine the relative brightness and temperature of a white dwarf star
47	Skills	A	56.1	Space Exploration	Analyze an illustration of an astrolabe experiment to determine what is being measured
48	Skills	C	73.7	Space Exploration	Identify the characteristics of a reflecting telescope
49	Skills	C	57.1	Space Exploration	Evaluate information about Jupiter and compare it to the characteristics of the Earth
NR5	Knowledge	231	70.0	Space Exploration	Classify space technologies according to their functions
50	Knowledge	B	87.6	Space Exploration	Identify an environmental perspective associated with the establishment of a base on the moon