

**Grade 9 Achievement Test**  
**Science**  
**1999**

## Grade 9 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.

**This test was developed to be completed in 75 minutes; however, you may take an additional 30 minutes to complete the test.**

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

#### *Instructions*

- Calculators are recommended but not required.
- Use **only** an **HB** pencil to mark your answer.
- Read each question carefully.
- If you change an answer, **erase** your first mark **completely**.
- Try to answer every question.
- Now turn this page and read 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.

### Example

This test is for the subject of

- A. mathematics
- B. science
- C. language arts
- D. social studies

### Answer Sheet

☐ A ☒ B ☐ C ☐ D

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

## Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.

### Examples

#### Calculation Questions and Solutions

A mechanic used a hydraulic press to compress a spring. If the hydraulic press exerts a pressure of  $50.0 \text{ N/cm}^2$  and the surface area of the spring is  $1.25 \text{ cm}^2$ , the force exerted on the spring is \_\_\_\_\_ N (newtons).

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

Answer: 62.5 N (newtons)

Record 62.5 on the answer sheet

6	2	.	5
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/> 0	<input type="radio"/> 0	<input type="radio"/> 0	<input type="radio"/> 0
<input type="radio"/> 1	<input type="radio"/> 1	<input type="radio"/> 1	<input type="radio"/> 1
<input type="radio"/> 2	<input checked="" type="radio"/>	<input type="radio"/> 2	<input type="radio"/> 2
<input type="radio"/> 3	<input type="radio"/> 3	<input type="radio"/> 3	<input type="radio"/> 3
<input type="radio"/> 4	<input type="radio"/> 4	<input type="radio"/> 4	<input type="radio"/> 4
<input type="radio"/> 5	<input type="radio"/> 5	<input type="radio"/> 5	<input checked="" type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/> 6	<input type="radio"/> 6	<input type="radio"/> 6
<input type="radio"/> 7	<input type="radio"/> 7	<input type="radio"/> 7	<input type="radio"/> 7
<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8
<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9

A block of wood is floating in a pan of distilled water. If  $\frac{1}{4}$  of the block remains out of the water, the block has a specific gravity of \_\_\_\_\_.

Record your answer **to the nearest hundredth or two decimal places** in the numerical-response section on the answer sheet.

Answer: 0.75

Record 0.75 on the answer sheet →

0	.	7	5
---	---	---	---

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

### Correct-Order Question and Solution

The following is a list of electrical appliances.

- 1 refrigerator
- 2 oven
- 3 blender
- 4 toaster

When the appliances listed above are placed in alphabetical order, the order is

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

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

Answer: 3214

Record 3214 on the answer sheet →

3	2	1	4
---	---	---	---

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

### Selection Question and Solution

The following illustrations are of animals that live in Alberta.



1



2



3



4

Identify each illustration, as numbered above, with its name, as given below.

\_\_\_\_\_ moose \_\_\_\_\_ goat \_\_\_\_\_ deer \_\_\_\_\_ sheep

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

Answer: 2431

Record 2431 on the answer sheet →

2	4	3	1
---	---	---	---

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



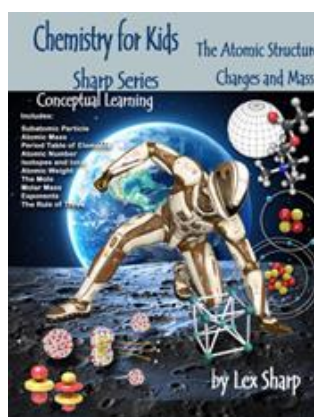
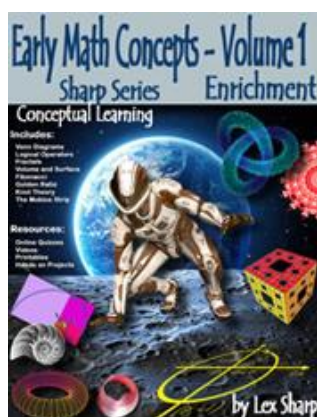
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## SCIENCE AND MAKING A MOVIE

An executive producer is hired to make an action-adventure movie in Alberta.

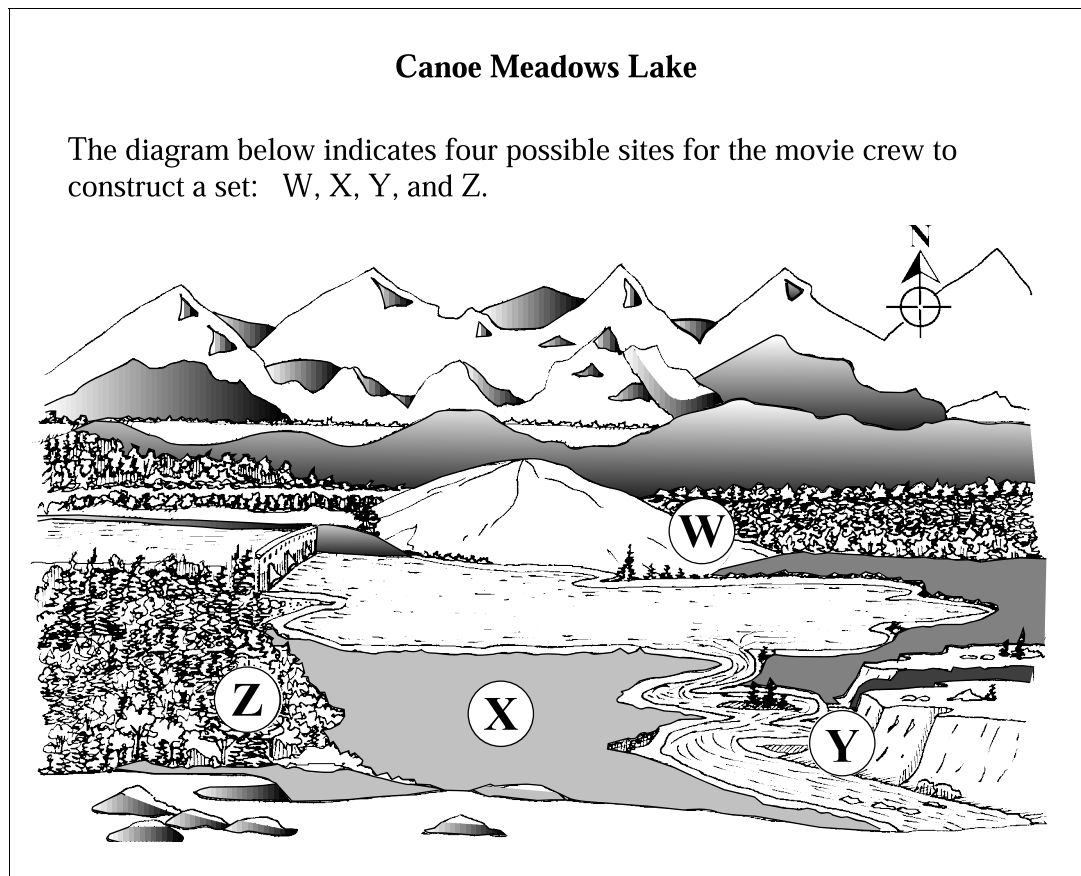
The executive producer's responsibilities include supervision of:

- set location
- base camp and movie set construction
- pyrotechnics
- production and equipment



1. The executive producer must hire an environmental consultant. The perspective that an environmental consultant has is
  - A. ecological
  - B. recreational
  - C. economic
  - D. scientific

Use the following information to answer question 2.

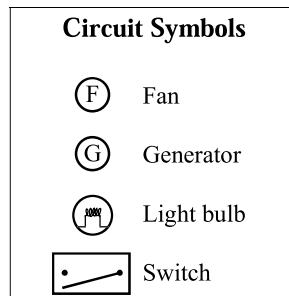


2. The environmental consultant recommends choosing a site that would maximize the use of solar power. Given this information, the **best** site would be
- A. W
  - B. X
  - C. Y
  - D. Z
- 
3. One site considered for the filming had low levels of uranium in the ground. Uranium gives off gamma rays, which can destroy film. Gamma rays travel by the process known as
- A. conduction
  - B. convection
  - C. radiation
  - D. emission

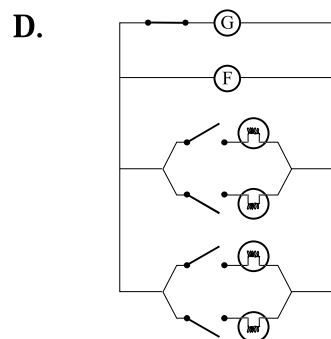
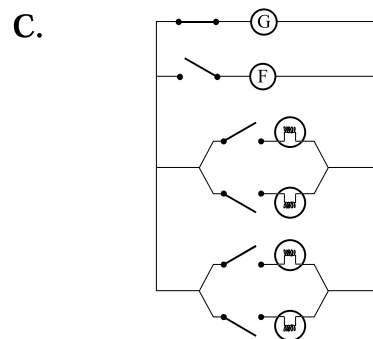
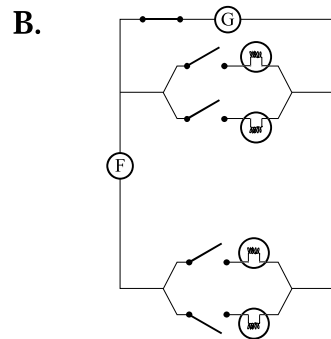
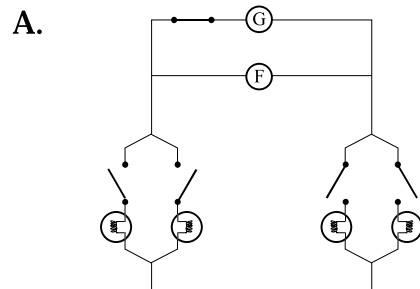
Use the following information to answer question 4.

In a particular scene, four lights and a fan connected on the same circuit must each be able to operate independently.

An electrician used the symbols shown below to draw a diagram of the circuit.

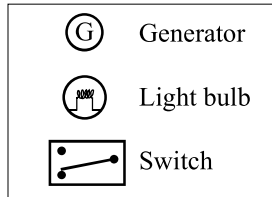


4. Which of the following circuit diagrams did the electrician draw?

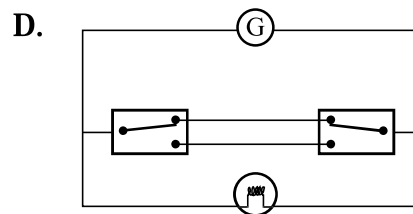
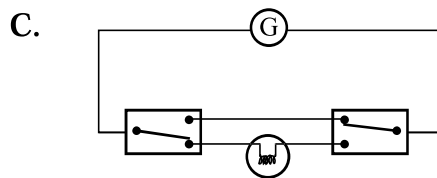
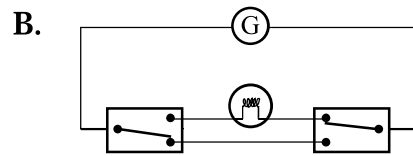
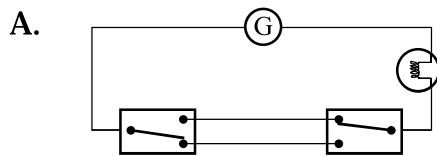


Use the following information to answer question 5.

On another set, the director must be able to turn a special effects light off and on from two different locations. The electrician drew a circuit diagram using the symbols shown below.



5. Which of the following circuit diagrams did the electrician draw?



### Numerical Response

1. In one scene, an actor steps on a switch plate and a small explosion occurs. The pressure that is needed to trigger the switch is  $7\,350\text{ N/m}^2$  or  $7\,350\text{ Pa}$ . The area of the switch plate is  $0.20\text{ m}^2$ . The minimum force needed to trigger the switch is \_\_\_\_\_ N.

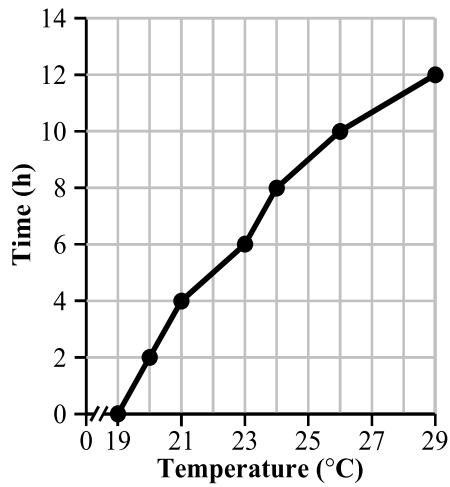
Record **all four digits** of your answer in the numerical-response section on the answer sheet.

Use the following information to answer question 6.

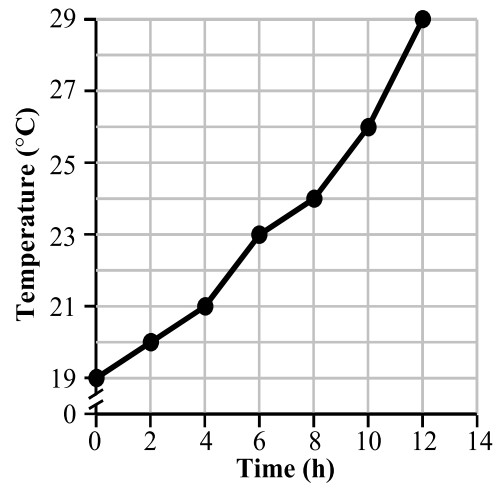
At one location, the set engineer recorded the temperature over a 12-hour period.	Time (h)	Temperature (°C)
	0	19
	2	20
	4	21
	6	23
	8	24
	10	26
	12	29

6. Which of the following graphs **best** illustrates this data?

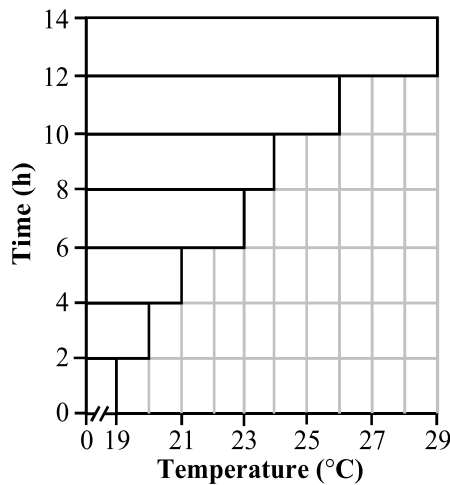
A.



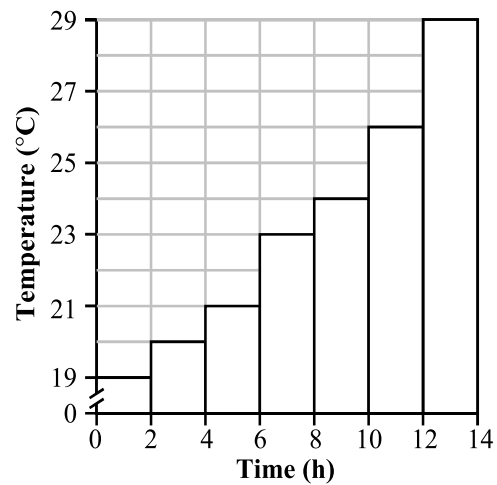
B.



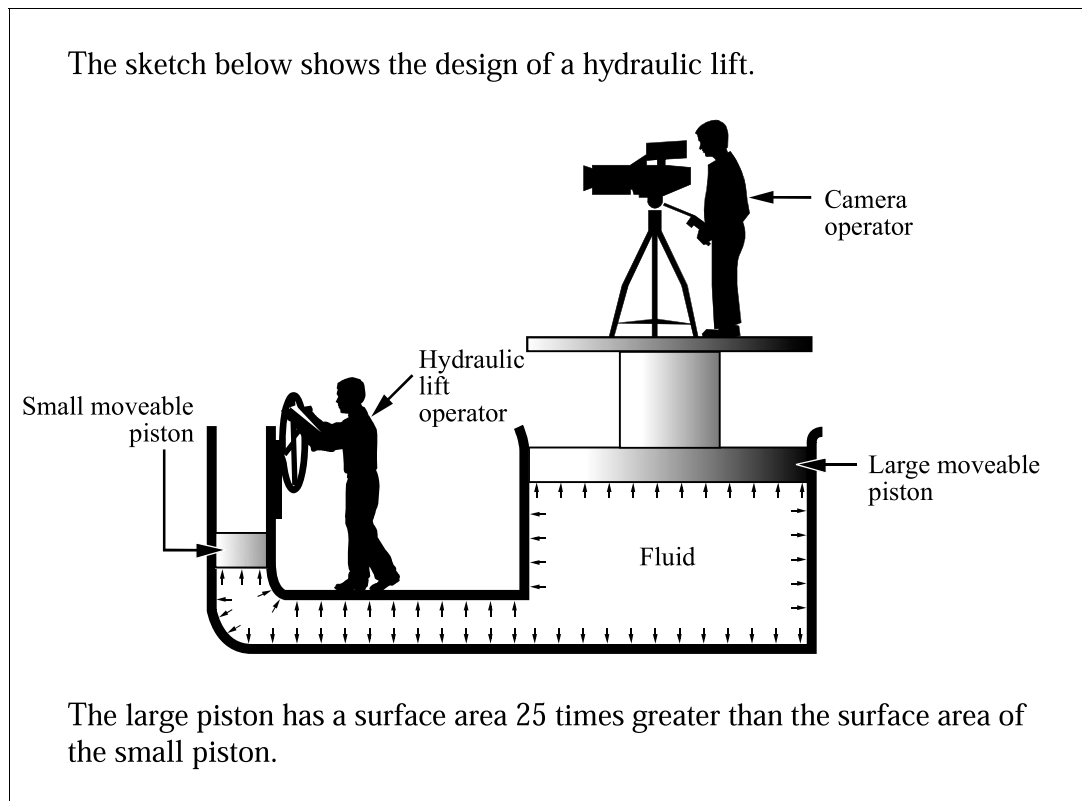
C.



D.



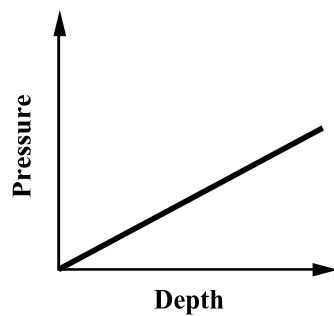
Use the following information to answer questions 7 and 8.



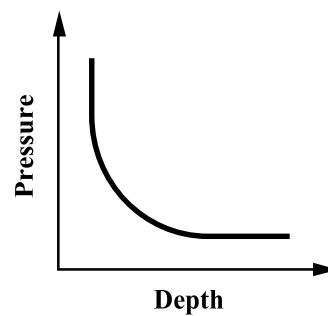
7. A hydraulic lift operates on the principle that
- A. fluids are highly compressible
  - B. as altitude or height increases, pressure decreases
  - C. in a closed system a small force multiplies itself over a large area
  - D. pressure on the fluid must be greater on the small piston than on the large piston
8. If the maximum force applied by the hydraulic lift operator is 200 N, then the maximum load that can be lifted by the large piston is
- A. 2 000 N
  - B. 2 500 N
  - C. 5 000 N
  - D. 10 000 N

9. In the movie, scuba divers must swim to the base of a dam to retrieve stolen gems. Which of the following graphs represents the relationship between the depth of the water and the water pressure behind the dam?

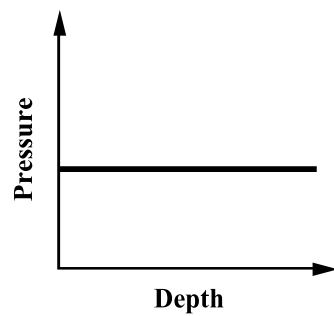
A.



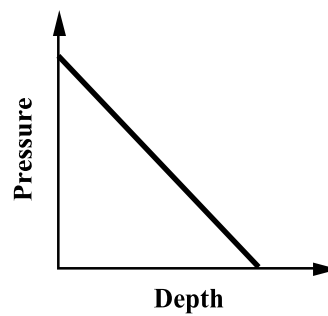
B.



C.

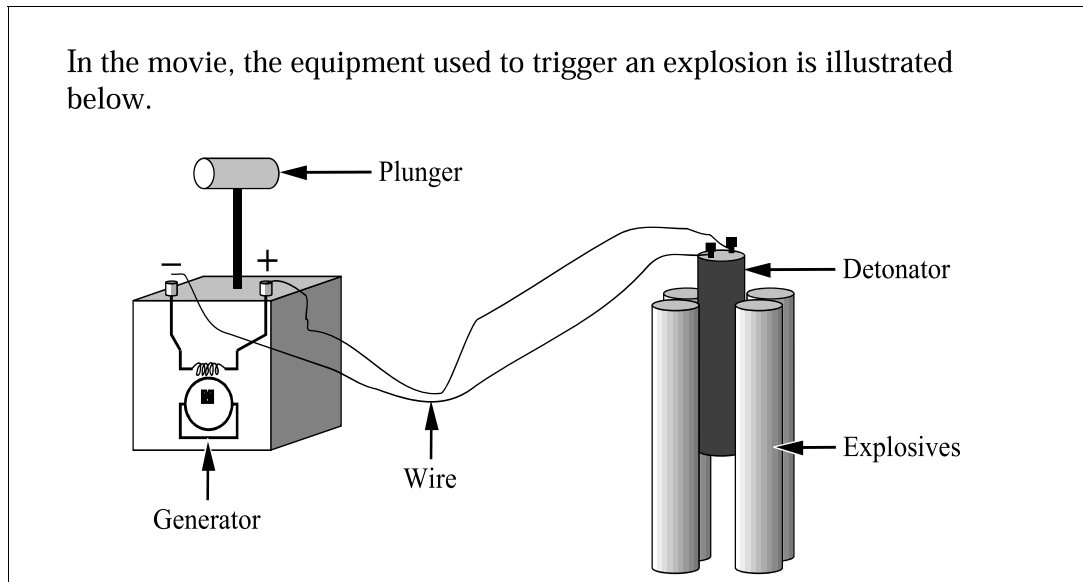


D.





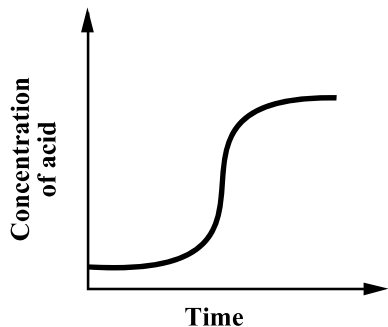
Use the following information to answer questions 10 and 11.



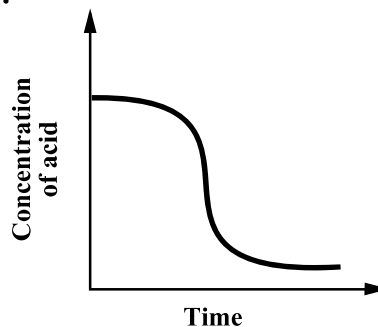
10. The energy conversions that take place from the time the plunger is pushed down to the time the explosives detonate are from
- A. electrical to mechanical to chemical
  - B. mechanical to electrical to chemical
  - C. chemical to electrical to mechanical
  - D. mechanical to chemical to electrical
11. The generator produces an electric current when a
- A. magnet moves across a static charge
  - B. coil of wire moves around a magnet
  - C. static charge is built up through friction
  - D. build up of static charge is released

12. In the film developing lab, acid was accidentally spilled. A base was used to neutralize the acid. Which of the following graphs illustrates what happens to the concentration of an acid as the base is mixed with it?

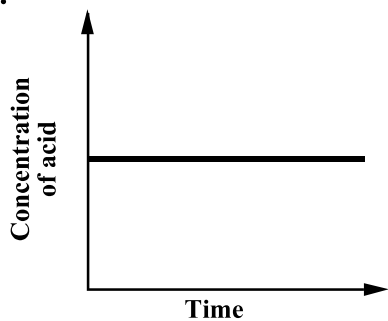
A.



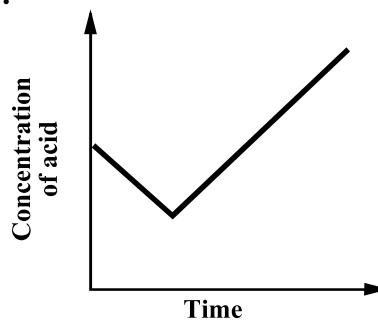
B.



C.



D.

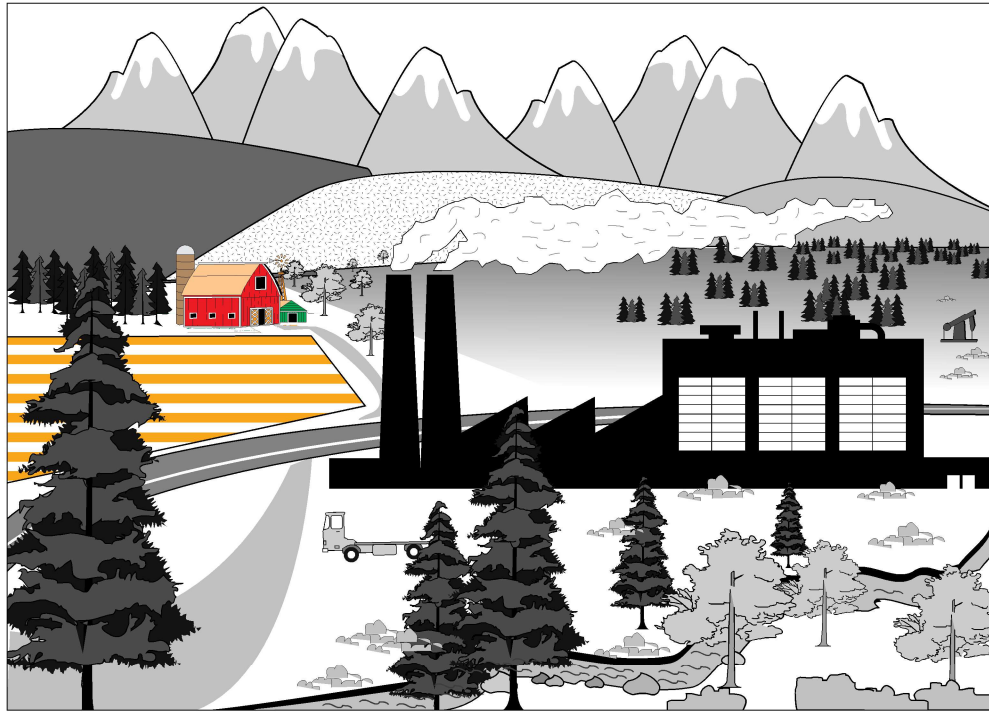


*Use the following information to answer question 13.*

After filming for the day, the crew decides to relax in a pool at Banff.

13. Which of the following pools would provide them with the **most** buoyancy?
- A. A sulphur spring pool at 40°C
  - B. A freshwater pool at 40°C
  - C. A sulphur spring pool at 36°C
  - D. A freshwater pool at 36°C

## A FERTILIZER PRODUCTION PLANT



A fertilizer production plant uses natural gas to manufacture fertilizer. The plant released a report that explains how it will reduce sulphur oxide emissions from its smokestacks. The plant has easy access to water because it is constructed close to an agricultural region that uses an irrigation system dependent on nearby rivers, canals, and lakes.

Use the following information to answer question 14.

A technician uses the following chart of compounds and explains that the chemical makeup of some fertilizers includes nitrogen (N), phosphorus (P), and potassium (K).

	Name of compound	Chemical formula	Solubility in water
I	Ammonium nitrate	$\text{NH}_4\text{NO}_3$	high
II	Potassium nitrate	$\text{KNO}_3$	high
III	Calcium phosphate	$\text{Ca}_3(\text{PO}_4)_2$	low
IV	Ammonium phosphate	$(\text{NH}_4)_3\text{PO}_4$	high

14. The two compounds that could be mixed together and dissolved in water to create a fertilizer are compounds
- A. I and IV
  - B. II and III
  - C. I and II
  - D. II and IV

Use the following information to answer question 15.

The fertilizer plant is located in an area where the weather is dominated by northwesterly winds (winds from the northwest).

15. The fertilizer plant would **most likely** have the **least** environmental impact on a town if the plant were located
- A. west of the town
  - B. east of the town
  - C. northwest of the town
  - D. southeast of the town

16. Students from the town's high school are concerned that emissions from the fertilizer plant contribute to the greenhouse effect. These emissions contain
- A. ozone, which traps infrared energy
  - B. ozone, which absorbs infrared energy
  - C. carbon dioxide, which absorbs infrared energy
  - D. carbon dioxide, which traps infrared energy
17. Environmentalists predict that after the plant has been in operation for ten years, the emissions will **most likely**
- A. raise the pH of the irrigation system's water because of the acidity
  - B. increase the effects of acid rain on the organisms in the area
  - C. reduce the community's concern about environmental quality
  - D. help the corporation improve its public relations image
18. From the perspective of long-term environmental quality, the farmers of the area would be **most** concerned with the
- A. use of the local transportation system by the corporation
  - B. accidental deaths at the fertilizer plant or gas wells
  - C. availability of cheaper fertilizer from the plant
  - D. release of sulphur oxides from the plant
19. Not far from the town, a pulp and paper mill is being built. The owners of the mill believe that with clear-cut harvesting and a reforestation program, the mill can have a harvestable forest forever. The mill owners have a perspective that is primarily concerned with
- A. the environment
  - B. education
  - C. ethics
  - D. economics

## SCIENCE AND THE CONSTRUCTION INDUSTRY

The Envirosafe Construction Company has been awarded a contract to construct a divided highway in the Kananaskis Country during the months of March to November. You are a consultant hired by Environment Canada to collect data about the environment. While working on site, you will stay in one of the old bunkhouses.



20. The construction foreman has to decide whether to put a layer of clay or gravel under the campsite. The area will be returned to its natural state after the construction, and you know that clay would be the better material because it
- A. allows water to flow away more quickly
  - B. is easily levelled after construction
  - C. is not as easy to compact as gravel
  - D. stops pollutants from seeping into ground water

Use the following information to answer questions 21 and 22.

While a camp waste pit is being excavated, you notice a white, crystalline substance. You decide to find out what the substance is before removing it. When mixed with water, some of the substance disappears. You pour some of the solution on a plate, and when the liquid evaporates, the crystals reappear.

21. The evidence that the crystalline substance underwent a physical change is that
- A. some of the water turned white
  - B. not all of the substance disappeared
  - C. the change produced heat
  - D. the change could be reversed

Use the following additional information to answer question 22.

Using a resource book, you find the following information on pure substances.

**Properties of Some Pure Substances**

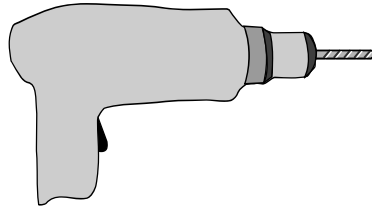
Substance	Melting Point (°C)	Density (g/cm <sup>3</sup> )	Solubility in Water	Appearance
Copper II Sulphate	—	2.3	dissolves	blue solid crystals
Calcium Carbonate	—	2.9	does not dissolve	grey-white solid
Sodium Chloride	801	2.2	dissolves	white solid crystals
Calcium Hydroxide	—	2.2	does not dissolve	white solid

22. The substance that you found is **most likely**
- A. copper II sulphate
  - B. calcium carbonate
  - C. sodium chloride
  - D. calcium hydroxide



*Use the following information to answer questions 23 and 24.*

To hang some pictures in your bunkhouse, you place a charged battery into your electric drill and then drill a hole in the wall.

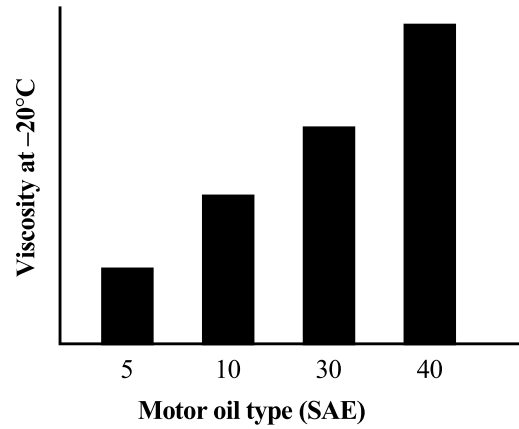


23. To which part of the drill do you attach the bit?
- A. Coil
  - B. Armature
  - C. Permanent magnet
  - D. Split-ring commutator
24. Using this drill to make a hole in the wall is an example of converting
- A. chemical energy to potential energy and then to mechanical energy
  - B. chemical energy to electrical energy and then to mechanical energy
  - C. electrical energy to thermal energy and then to electrical energy
  - D. electrical energy to kinetic energy and then to electrical energy
- 
25. While you are cooking with the hot plate and toasting a slice of bread, the electric heaters start. Almost immediately, the hot plate, toaster, and electric heaters quit working. This **most likely** happened because
- A. a fuse in the toaster burned out
  - B. a circuit breaker in the electrical panel tripped
  - C. the element in the hot plate burned out
  - D. the circuit breakers in the electric heaters tripped

26. While checking all the fuses and circuit breakers, you notice that in the electrical panel, a 20A fuse has been placed in the circuit designed for a 15A fuse. This is a dangerous situation because
- A. the fuse does not fit properly
  - B. the fuse may cause an electrical shock
  - C. an increase in electrical current may cause the fuse to trip
  - D. an increase in electrical current may cause the wires to overheat
27. The device on an electric heater that controls how much electric current will flow through the electric heater, and therefore how much heat is produced, is called a
- A. resistor
  - B. switch
  - C. variable resistor
  - D. breaker switch
28. The maintenance supervisor asks you to help change the oil in his truck. If it takes 70 seconds for 50 mL of dirty oil to flow out of the engine, the flow rate is
- A. 0.71 mL/s
  - B. 1.4 mL/s
  - C. 20.0 mL/s
  - D. 35.0 mL/s

Use the following information to answer question 29.

The maintenance supervisor sketches a graph showing the viscosity of different motor oils at  $-20^{\circ}\text{C}$ .



29. To ensure ease of starting, the type of motor oil that should be used in the truck's engine in extreme cold is
- A. SAE 5
  - B. SAE 10
  - C. SAE 30
  - D. SAE 40

Use the following information to answer question 30.

To study the effects of the campsite on the soil, you collected soil samples from four different sites in the camp area before the camp was set up, during the project, and after the campsite was removed. This chart shows the data you collected.

Site	pH Level		
	Before	During	After
1	7.6	7.2	6.6
2	7.8	7.5	6.9
3	7.5	7.4	7.4
4	7.4	6.9	6.5

30. You conclude that the activities at the campsite caused the soil to become
- A. neutral
  - B. more basic
  - C. more acidic
  - D. polluted

## TAR SANDS IN NORTHERN ALBERTA

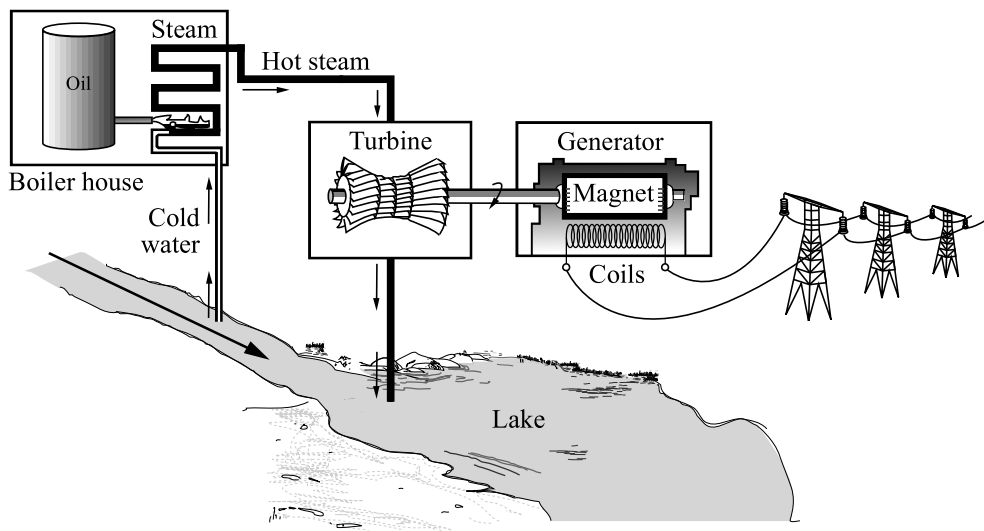
A representative for the tar sands has arranged for a group of foreign business delegates to tour the tar sands in Northern Alberta. During their tour they learn about oil extraction and how electricity can be produced from crude oil. They also visit the worker's housing area.



31. A technician explains that, to extract oil from the tar sands, superheated steam is injected into the tar sand formation underground. This causes the oil to separate from the sand so that it can be pumped out of the ground. This steam causes the oil to separate from the sand because the viscosity of liquids
- A. decreases when there is an increase in water content
  - B. increases when there is an increase in water content
  - C. increases when there is an increase in temperature
  - D. decreases when there is an increase in temperature

Use the following information to answer numerical-response question 2.

An engineer in the delegation is interested in the use of crude oil from the tar sands as an energy source to produce electricity. The diagram below illustrates a process that could produce this energy.



Cold water would enter the boiler house at  $10^{\circ}\text{C}$  and would be heated to  $100^{\circ}\text{C}$  to be converted into steam. The specific heat capacity of water is  $4.2 \text{ kJ}/(\text{kg} \cdot ^{\circ}\text{C})$ .

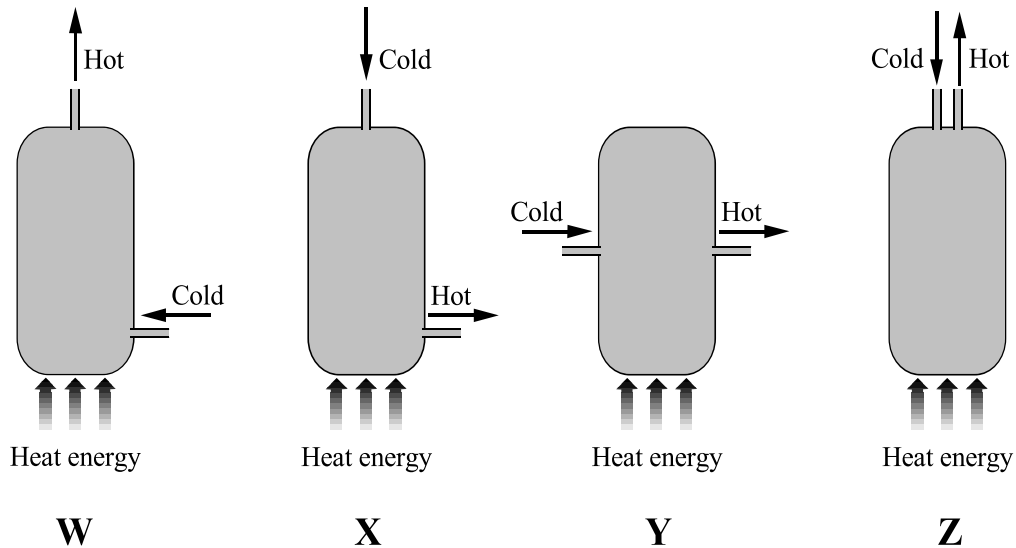
### Numerical Response

2. The number of kilojoules of heat that must be absorbed by 20 kg of water in order to raise its temperature from  $10^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  is \_\_\_\_\_ kJ.

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

Use the following information to answer question 32.

A technician explains that, to produce enough steam to extract the oil, a continuous flow of hot water is required. He shows four diagrams of how hot and cold water pipes could be connected to a hot water tank.



32. The **most efficient** method of heating cold water is shown in diagram

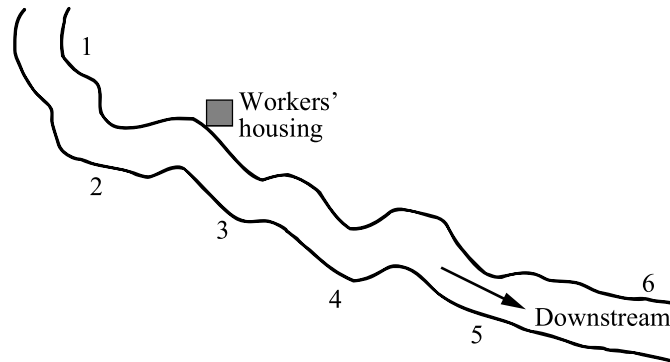
- A. W
- B. X
- C. Y
- D. Z

33. A technician explains to the delegates that in order to reduce the cost of heating the workers' housing, the company is considering installing a popular active solar heating system. Which of the following statements describes a component of an active solar heating system?

- A. Water pipes are made of glass to allow for maximum energy transmission.
- B. A highly reflective material is used to ensure the efficient use of sunlight.
- C. A heat-absorbing layer of material is used to transfer heat to the water pipes.
- D. Small electric fans are used to prevent overheating of the collector.

Use the following information to answer question 34.

Treated waste water from the workers' housing is discharged into a river. A delegate interested in water quality wants to know more about the impact of the waste water on the river system. The tar sands representative shows the delegate the results of a study in which water samples were collected from six different sites along the river.



The oxygen concentration for each sample was determined and the following chart was made.

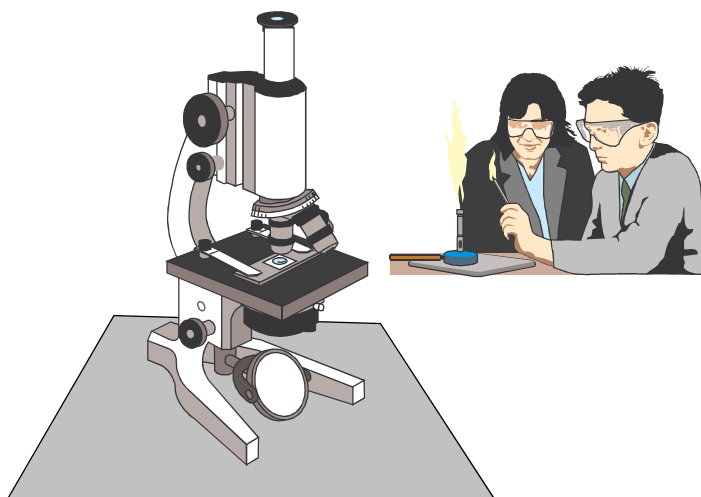
Site Number	Oxygen Concentration (mg/L)
1	12.0
2	12.5
3	8.0
4	3.5
5	2.0
6	5.0

34. Based on this data, the delegate inferred that immediately downstream from the workers' housing the treated waste water discharged
- A. had no effect on the quality of river water
  - B. added toxic chemicals to the river water
  - C. improved the abiotic conditions of the river water
  - D. decreased the concentration of oxygen of the river water



## SCIENCE RESEARCH AND FIELD STUDIES

You have been hired for the summer to work as an assistant at a science research centre located in southern Alberta. As an assistant, you will perform experiments, work with tradespeople, and collect data in the field.



*Use the following information to answer question 35.*

While doing research for an experiment on the acidic nature of fruit, you read an information pamphlet about apple production. The pamphlet outlines issues surrounding a spray used on apples grown in Canada. Some people say that the spray may be causing long-term health problems for some people. The fruit growers say they cannot operate their orchards at a profit without the spray.

35. Considering the possible health problems of some people, the **most responsible** action for the fruit growers to take is to shut down the operations of all the orchards immediately until
- A. the people with the long-term health problems get better
  - B. experiments are conducted to determine whether the spray does harm people
  - C. apples can be imported from the United States
  - D. a less-concentrated spray is available on the market

Use the following information to answer question 36.

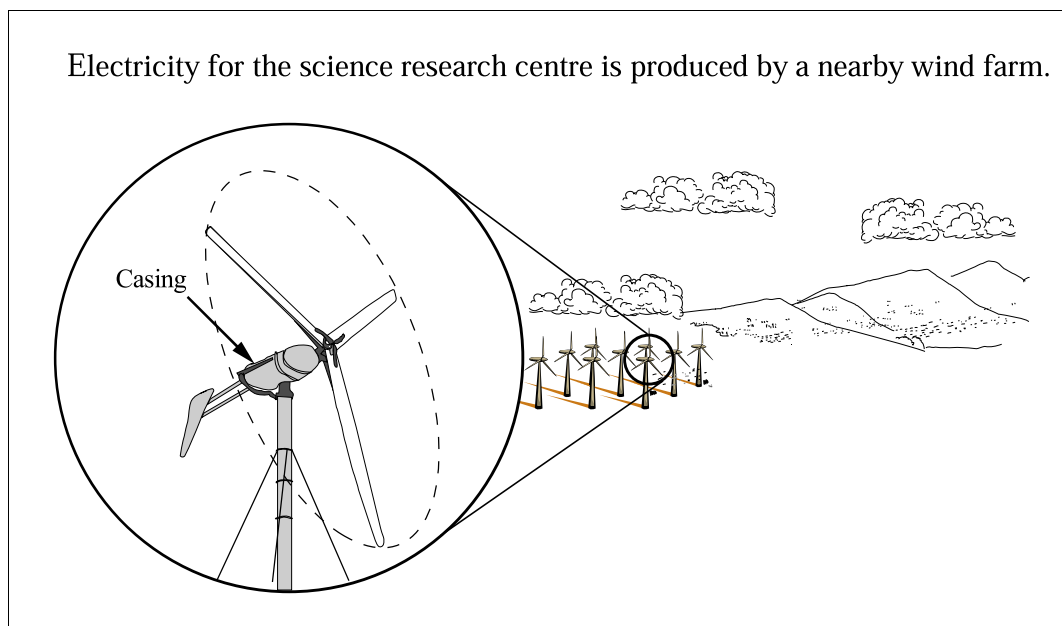
A researcher at the centre unpacks a box containing four glass vials. The vials are numbered 1, 2, 3, and 4, and each contains a different liquid. The researcher asks you to perform three tests to determine whether the substance in each vial is acidic, basic, or neutral. You make the following observations.

	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>
	Two drops from each vial are placed on a piece of zinc	One drop from each vial is placed on red litmus paper	One drop from each vial is placed on blue litmus paper
<b>Vial 1</b>	gas bubbles appear	no colour change	turns red
<b>Vial 2</b>	no reaction takes place	turns blue	no colour change
<b>Vial 3</b>	no reaction takes place	no colour change	no colour change
<b>Vial 4</b>	gas bubbles appear	no colour change	turns red

36. The liquids in vials 1, 2, 3, and 4 are, respectively,

- A. basic, acidic, neutral, and basic
- B. neutral, basic, acidic, and neutral
- C. acidic, basic, neutral, and acidic
- D. neutral, acidic, basic, and neutral

Use the following information to answer question 37.



37. Within the casing, electricity is produced as a result of

- A. a coil of wire spinning around an insulator
  - B. a coil of wire spinning within a magnetic field
  - C. an insulator spinning around a coil of wire
  - D. magnets spinning within an electric field
- 

Use the following information to answer questions 38 and 39.

You have been assigned the task of identifying an irregular-shaped piece of metal. Using the displacement method to calculate the volume of the metal, you place it into a graduated cylinder containing 50 mL of water. The new volume is 65 mL. Using a balance scale, you determine the mass of the metal to be 158 g.

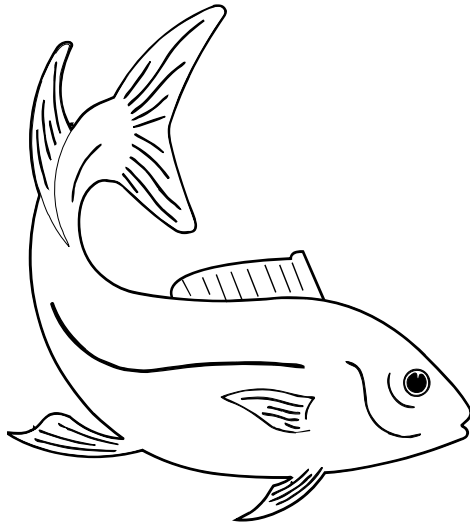
38. The density of the unknown metal is

- A.  $0.0949 \text{ g/cm}^3$
- B.  $2.43 \text{ g/cm}^3$
- C.  $3.16 \text{ g/cm}^3$
- D.  $10.53 \text{ g/cm}^3$

39. When you place the unknown metal in the graduated cylinder, the weight of the object appears to drop from 1.55 N to 1.40 N. The buoyant force exerted by the water on the unknown metal is
- A. 0.15 N
  - B. 1.40 N
  - C. 1.55 N
  - D. 2.95 N
- 
40. After doing a number of experiments involving buoyant force, you recall that as the
- A. density of a fluid increases, the buoyant force decreases
  - B. density of a fluid decreases, the buoyant force increases
  - C. density of a fluid increases, the buoyant force remains the same
  - D. density of a fluid decreases, the buoyant force decreases

*Use the following information to answer question 41.*

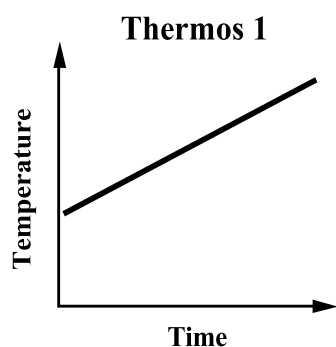
The research centre has developed a new type of weed-eating fish. The fish can be used in irrigation canals where there is heavy weed growth.



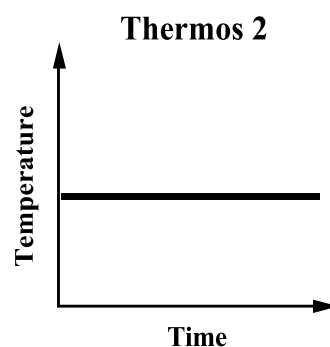
41. This special type of fish was developed through the process of
- A. natural selection
  - B. artificial selection
  - C. adaptive evolution
  - D. selective evolution

42. You test four different coffee thermoses and graph the data for each. The graph that **best** represents the results of a thermos that would keep coffee hot is

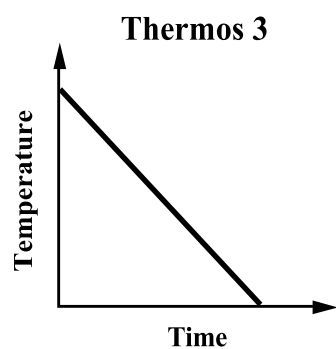
A.



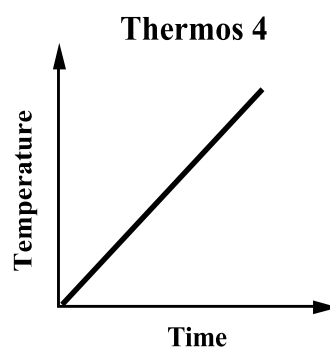
B.



C.

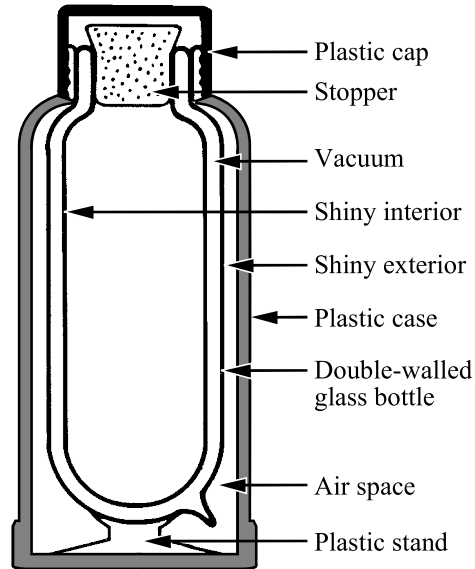


D.



Use the following information to answer question 43.

At the end of the day, you have a hot drink from your thermos. A cross section of the thermos is shown below.



43. Which of the following statements **best** explains why the drink remains hot in a thermos?
- A. Air is a good conductor of heat.
  - B. A vacuum is a poor conductor of heat.
  - C. Plastic does not conduct heat well.
  - D. Shiny surfaces do not reflect heat well.

Use the following fictional newspaper article to answer numerical-response question 3.

You happen to read an article from a local paper and become very concerned about the impact that new chemical plants may have on the community.

### **Plants to emit 70% more ethylene**

*Companies say local crops won't suffer*

Two large, new chemical plants scheduled to open in the year 2005 in our community will spew at least 70% more ethylene into the air than does the existing plant. Alberta has only recently developed guidelines for acceptable levels of ethylene emissions, and already representatives from the plants acknowledge that ethylene emissions will exceed these levels for several days a year.

This could be bad news for area farmers says Alex Jones, a local researcher. Jones noted that the

guidelines were developed in order to protect crops. He explained that although ethylene, an organic hydrocarbon, can help fruit ripen if it is administered in small doses, in high doses, it can turn crops brown. He further cautioned that exposure to very high levels of ethylene can cause memory loss in humans.

Plant representatives argue that the Alberta guidelines were based on those of Ontario and may not be relevant here because hardier crops are grown in Alberta than in Central Canada.

### **Numerical Response**

**3.** Several concerns are raised in this article. Some of the concerns raised are related to

- 1** economics
- 2** health
- 3** the environment
- 4** politics

Match the concerns, as numbered above, to the descriptions given below. Use each number only once.

human memory  
loss can occur

70% more  
ethylene emitted

high doses can  
turn crops brown

guidelines for  
emissions

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

## INVESTIGATING NATURE

*Use the following information to answer question 44.*

Before investigating animal life in a pond, you refer to your field manual and find the following information.

### Oxygen Requirements of Some Freshwater Invertebrates

OXYGEN CONCENTRATION (mg/L)	ORGANISMS PRESENT
8 and above (excellent level)	<ul style="list-style-type: none"><li>• large variety of invertebrates (insect larvae of many kinds, worms, etc.)</li></ul>
6 (good level)	<ul style="list-style-type: none"><li>• a few mayfly larvae</li><li>• some stonefly larvae</li><li>• many midge larvae</li><li>• many worms, including leeches</li></ul>
4 (critical level)	<ul style="list-style-type: none"><li>• many midge larvae</li><li>• many worms, including leeches</li></ul>
2 (low level)	<ul style="list-style-type: none"><li>• many midge larvae</li><li>• some worms, including leeches</li></ul>
less than 2 (very low level)	<ul style="list-style-type: none"><li>• some midge larvae</li><li>• some worms</li></ul>

44. You collect water samples from the pond and find more midge larvae than mayfly larvae. You infer that the oxygen concentration in this pond is **most likely**
- A. 6 mg/L
  - B. 4 mg/L
  - C. 2 mg/L
  - D. less than 2 mg/L



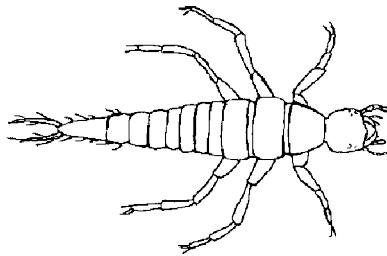
*Use the following information to answer question 45.*

In one of the water samples taken from the pond, you notice a small organism. Unable to identify the organism in your field manual, you note that it has the following characteristics.

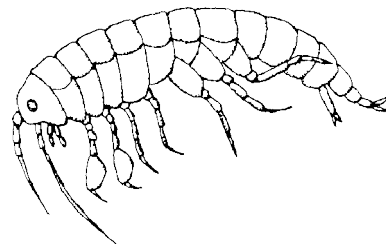
- three distinct body parts
- jointed legs
- ability to change colour
- specialized mouth parts

45. Given the characteristics noted above, which of the following pictures from your field manual is **most like** the organism you are trying to identify?

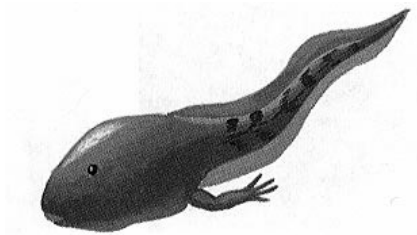
A.



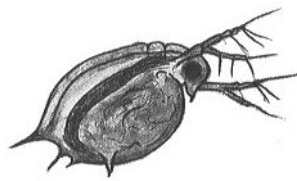
B.



C.



D.



Use the following information to answer question 46.

To gather information about a nearby stream, you collect data on the following factors.

**Some Abiotic and Biotic Factors**

- I** Oxygen content
- II** Undissolved solids
- III** Variety of life forms
- IV** Flow rate
- V** Temperature

46. You decide to research biotic factors first and you know that, of the above factors,
- A. III only is biotic
  - B. I and V are biotic
  - C. I, II, and IV are biotic
  - D. II and III are biotic
- 

Use the following information to answer question 47.

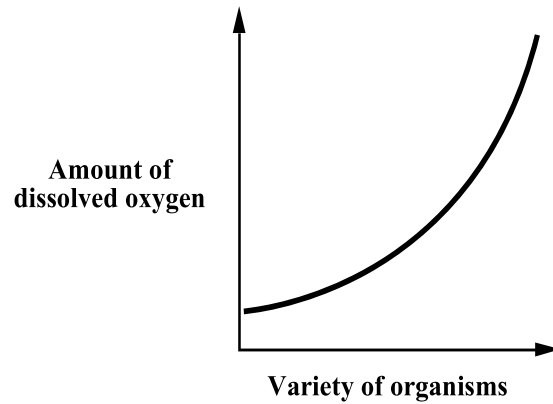
The stream empties into a lake. Within the lake, you observe two different species of fish.



47. The process **most likely** responsible for the development of different species of fish is
- A. artificial selection
  - B. artificial breeding
  - C. selective breeding
  - D. natural selection

Use the following information to answer question 48.

After making more observations about the lake, you sketch a graph of the relationship between the variety of organisms in the water and the amount of dissolved oxygen in the water, as shown below.



48. From this graph, you infer that the variety of organisms will
- A. increase as the amount of dissolved oxygen decreases
  - B. decrease as the amount of dissolved oxygen increases
  - C. increase as the amount of dissolved oxygen increases
  - D. remain the same no matter what the amount of dissolved oxygen may be

Use the following information to answer numerical-response question 4.

On further investigation of the lake ecosystem, you record the following observations.

- 1 The tadpoles are changing into adult frogs.
- 2 A water lily floating on the surface of the lake has a large surface area.
- 3 There is evidence of mosquito eggs, larvae, and adults.
- 4 Hydra, living in a pond, is producing buds.

### Numerical Response

4. Match each observation, as numbered above, with the science term given below. Use each number only once.

life cycle

environmental  
adaptation

metamorphosis

asexual  
reproduction

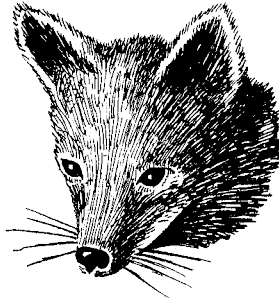
Record **all four digits** of your answer in the numerical-response section on the answer sheet.

Use the following information to answer question 49.

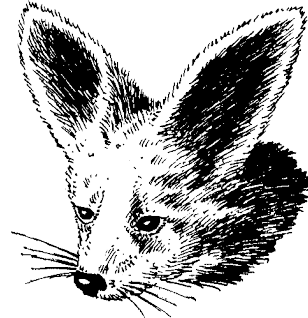
After investigating the lake ecosystem, you saw a fox. Your field manual shows three closely related species of foxes from different environments.



Arctic fox



Deciduous forest fox

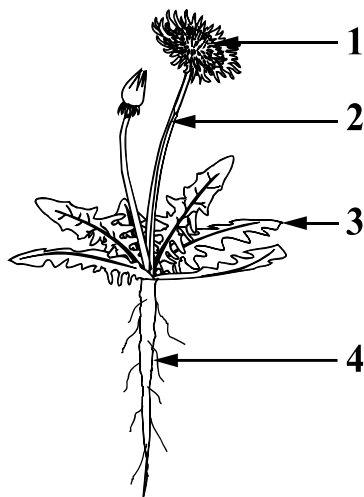


Desert fox

49. Comparing the three species of foxes, you infer that the desert fox has the biggest ears so that it can
- A. increase the amount of body heat lost to the surroundings
  - B. find its prey more easily
  - C. hear impending danger
  - D. increase its chances of finding running water in the desert
- 
50. Throughout the day, you observed a number of bees collecting nectar from the wildflowers. You recalled that bees are a species that have several forms adapted to specialized functions within their community. Another example of a species that has specialized functions is
- A. frogs
  - B. ants
  - C. snakes
  - D. dragonflies

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

You have obtained a sample of a plant common in the area. Below is an illustration of the plant.



### Numerical Response

5. Match each plant structure, as numbered above, with the function it performs, as given below. Use each number only once.

obtaining  
nutrients

food synthesis

reproduction

structural  
support

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

*You have now completed the test.  
If you have time, you may wish to check your answers.*

**KEY**  
**Grade 9 Science**  
**Achievement Test-1999**

Item	Key	Item	Key
1	A	28	A
2	B	29	A
3	C	30	C
4	C	31	D
5	A	NR2	7560
NR1	1470	32	A
6	B	33	C
7	C	34	D
8	C	35	B
9	A	36	C
10	B	37	B
11	B	38	D
12	B	39	A
13	C	40	D
14	D	41	B
15	D	42	B
16	D	43	B
17	B	NR3	2314
18	D	44	A
19	D	45	A
20	D	46	A
21	D	47	D
22	C	48	C
23	B	NR4	3214
24	B	49	A
25	B	50	B
26	D	NR5	4312
27	C		