

Longitudinal Study of American Youth

SCIENCE Form (Z)

INTRODUCTION

This booklet contains questions about science for you to answer. You will be able to answer some of the questions quickly and others will require more thought. Please do not feel discouraged if you are not absolutely sure of an answer. Some questions will ask about things you have covered in class, but others will not. Please do your best to answer each question. If you are not sure of the answer, read the question again, and make your best guess.

MARKING YOUR ANSWERS

Each question is followed by a set of possible answers labeled A, B, C, etc. Read each question carefully, then choose the *one* answer you think is the best, and darken in the letter on your *Answer Sheet* next to the number for that question. Be sure to mark only *one* letter for each question. Do not skip any questions.

Do not make any stray marks on your *Answer Sheet*. Do all of your calculations on the Question Booklet, and use the *Answer Sheet* only to record your answers.

If you have any questions while taking this test, raise your hand, and the person giving the test will come to your seat to help you.

Public Opinion Laboratory

Northern Illinois University DeKalb, Illinois 60115

1. As a spaceship approaches the Earth, it begins to get hot and glow. Which of the following best explains why this happens?

- (A) The increasing force of gravity causes the spaceship to become hot.
- (B) Friction heats the spaceship as it passes through the Earth's atmosphere.
- (C) Sunlight reflected from the spaceship's surface heats it.
- (D) Electricity in the air heats up the spaceship.

N413101

► **Questions 2-3.** Scientific discoveries in one area can often be applied to other areas. Is each of the following an example of this process?

2. Solid state research for small computers was applied in developing better television sets. (A) Yes (B) No

N407401

3. Laser research was applied in developing a superior method of eye surgery. (A) Yes (B) No

N407404

4. Due to the expansion of our universe, the wavelengths of the light from the most distant stars are shifted to longer wavelengths. A combination of which two of the following instruments could be used to measure this property of the distant stars?

- I. Telescope
- II. Microscope
- III. Spectrometer
- IV. Thermometer

(A) I and II

(C) II and III

(B) I and III

(D) III and IV

N418001

5. The Pacific Ocean is surrounded by a large belt of mountain ranges and volcanoes. Which natural events are most closely associated with these landforms?

(A) Hurricanes

(C) Sandstorms

(B) Tornadoes

(D) Earthquakes

N420401

6. Why are environmental-protection groups often opposed to the burning of coal to produce electricity?

(A) Power plants using coal require a great deal of space.

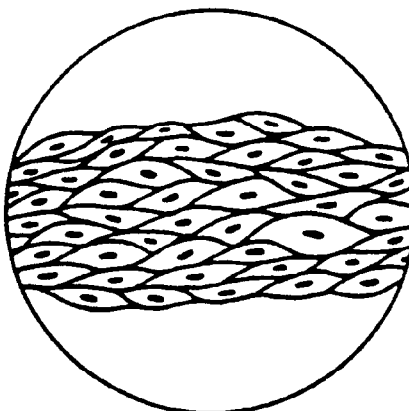
(B) Coal is in limited supply.

(C) The burning of coal releases pollutants into the air.

(D) Coal is more expensive to burn than wood.

N435201

7. A group of cells looks like this under a microscope.



These cells all work together to do the same thing. A group of cells like this is called

- (A) a tissue. (C) an organ.
(B) an organism. (D) a system. N405001
8. Lasers are used for many purposes. However, a laser would probably NOT be used for which of the following?
(A) Home heating (C) Welding
(B) Eye surgery (D) Entertainment N432101
9. When the Moon, the Earth, and the Sun are in the same line, as shown below, which of the following could occur?
-
- (A) An eclipse of the Sun could occur.
(B) An eclipse of the Moon could occur.
(C) The Moon could be pulled out of its orbit toward the Sun.
(D) The spin of the Earth could be speeded up. N414401
10. Half-life is a measure of
(A) distance. (C) time. (E) color.
(B) mass. (D) temperature. N407001
11. What happens to the sulfur dioxide released by a factory's smokestacks?
(A) The sulfur dioxide stays in the air forever.
(B) The sulfur dioxide immediately falls to earth as dust.
(C) The sulfur dioxide eventually falls to earth as acid rain.
(D) The sulfur dioxide escapes from the atmosphere into space. N405501

12. Five hundred cockroaches of one species were sprayed with a new insecticide. Twenty-four hours later nearly all the cockroaches were dead. A few, however, survived. This outcome illustrates which one of Darwin's key ideas?
- (A) All living things come from preexisting living things.
 - (B) Animals adapt to new environments.
 - (C) There is variation among individuals within a species.
 - (D) New species develop from survivors.
- N418501
13. Elements with chemical characteristics most similar to those of sodium are listed in what part of the periodic table?
- (A) Immediately to the right of sodium in the same row
 - (B) Immediately to the left of sodium in the same row
 - (C) Above and below sodium in the same column
 - (D) On the far right of the periodic table
- N419601
14. A chemist will frequently write a formula for some kind of matter. For example, H_2SO_4 is the formula for sulfuric acid. The numbers used in the formula stand for
- (A) the number of isotopes in a mole of substance.
 - (B) the number of grams of each atom in a given molecule.
 - (C) the number of atoms of each element in a given molecule.
 - (D) the number of molecules of each component in a mole of H_2SO_4 .
 - (E) the number of parts by weight of each material in a pound of substance.
- N411101
15. An artificial satellite travels in an easterly direction and orbits the Earth every 6 hours. To an observer in the central United States, the satellite would appear to
- (A) rise in the east and set in the west.
 - (B) rise in the west and set in the east.
 - (C) remain stationary above the observer's position.
- N434801
16. Which of the following statements correctly describes one of the connections between science and technology today?
- (A) Technological progress requires little input from science.
 - (B) Technology involves the practical applications of scientific knowledge.
 - (C) Workers in science use the laws and principles discovered by workers in technology.
 - (D) Technology is the part of science that deals with mechanical problems.
- N425201
17. An airport was built at the edge of a large city, despite the protests of those living in the neighborhood. They complained that the noise level would be hazardous to their health. During the first year of the airport's operation, the incidence of partial hearing loss in the region directly adjoining the airport rose 10 percent over that of the preceding year. Which of the following is a valid conclusion based on these data?
- (A) The protesters were correct. The increased noise had a harmful effect on the population.
 - (B) The increase in hearing loss was not significant.
 - (C) There may be a correlation between the noise and the increased hearing loss. Further study is appropriate.
 - (D) There is no proof that the noise caused the hearing loss and therefore nothing can be done.
- N428801

18. A medical researcher wanted to find out what caused a certain disease. She gathered the following information from different places in the world.

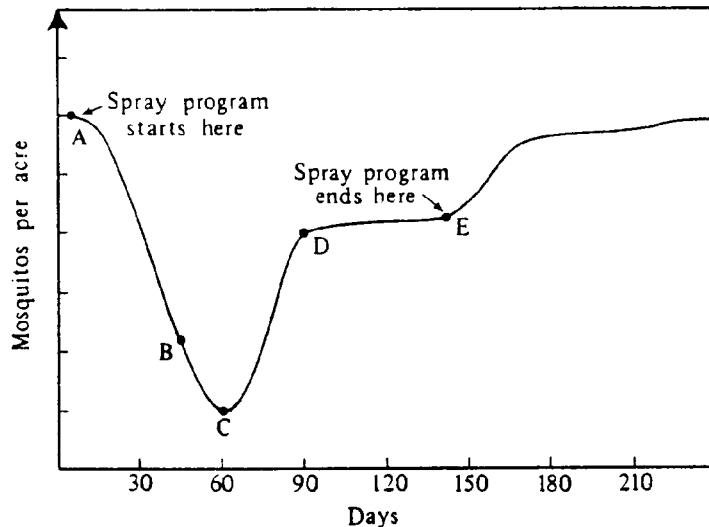
	Major Type of Food	Type of Area	Mosquitoes	Disease
Country 1	Fish only	City	Yes	Yes
Country 2	Meat and vegetables	Farmland	No	No
Country 3	Fish and rice	City	No	Yes
Country 4	Fish only	Farmland	Yes	Yes

Which one of the following would be best for the researcher to study more closely in order to find the cause of the disease?

- (A) Major type of food
 (B) Type of area
 (C) Mosquitoes
 (D) Swamps

N411201

19. A swamp near a camp was sprayed with pesticide at weekly intervals over several months in an attempt to eliminate the mosquito population. Daily counts of population size yielded the information shown in the graph below.



What portion of the graph represents the greatest increase in the number of resistant mosquitoes?

- (A) AB
 (B) BC
 (C) CD
 (D) DE

N437202

20. Which of the following best explains why insects or birds that are introduced to a new country often become pests in the new area?

- (A) Their food supply in the new country is unlimited.
 (B) The new country produces beneficial mutations.
 (C) The predators of their former habitat are lacking in the new country.
 (D) Competition among them increases.

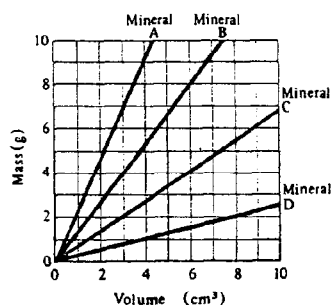
N428001

21. A female white rabbit and a male black rabbit mate and have a large number of baby rabbits. About half of the baby rabbits are black, and the other half are white. If black fur is the dominant color in rabbits, how can the appearance of white baby rabbits best be explained?

- (A) The female rabbit has one gene for black fur and one gene for white fur.
 (B) The male rabbit has one gene for black fur and one gene for white fur.
 (C) The white baby rabbits received no genes for fur color from the father.
 (D) The white baby rabbits are result of accidental mutations.

N424401

► Questions 22-23 refer to the graph.



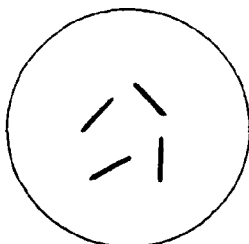
22. If you wish to obtain a sample of the mineral that has the greatest mass for a given volume, which of the minerals should you select?

- (A) A (B) B (C) C (D) D N436801

23. Water has a density of 1 gram per cubic centimeter. Which mineral(s) would float in water?

- (A) A only (B) D only (C) A and B only (D) C and D only N436802

24. A student collected a sample of pond water and looked at it through a microscope. The figure below shows four microorganisms that she saw in one microscopic field of view.



If the diameter of the field of view is 500 microns, approximately how long is one of these organisms?

- (A) 1,000 microns (C) 100 microns
 (B) 400 microns (D) 20 microns N436901

25. A formula for copper nitrate is $\text{Cu}(\text{NO}_3)_2$. For every copper atom in this compound, the number of oxygen atoms is

- (A) 1 (D) 5
 (B) 2 (E) 6
 (C) 3 N411401

26. A paper manufacturing company in your area produces large amounts of sulfuric acid as a waste by-product. In spite of efforts to carefully dispose of the waste, some of the acid continually escapes recovery and pollutes a nearby river, affecting wildlife and recreation. The company employs many area residents. Which of the following solutions to help stop the pollution would be preferred by the community?

- (A) Moving the company to a more isolated area and giving the workers the option to move
 (B) Adding a substance to the escaping acid to neutralize it
 (C) Adding an acid with a higher pH to the escaping acid
 (D) Storing the escaping acid in large holding tanks and then taking it to an industrial waste landfill

N429601

27. The ores of many metals are sulfides of the metals. In the refining process these ores are “roasted,” that is, the sulfur is combined with oxygen, liberating the metal or its oxide (e.g., $\text{CuS} + \text{O}_2 \rightarrow \text{Cu} + \text{SO}_2$). This process is most likely to result in which of the following?

- (A) Acid rain
- (B) Aging of lakes
- (C) Depletion of the ozone layer
- (D) Lead poisoning

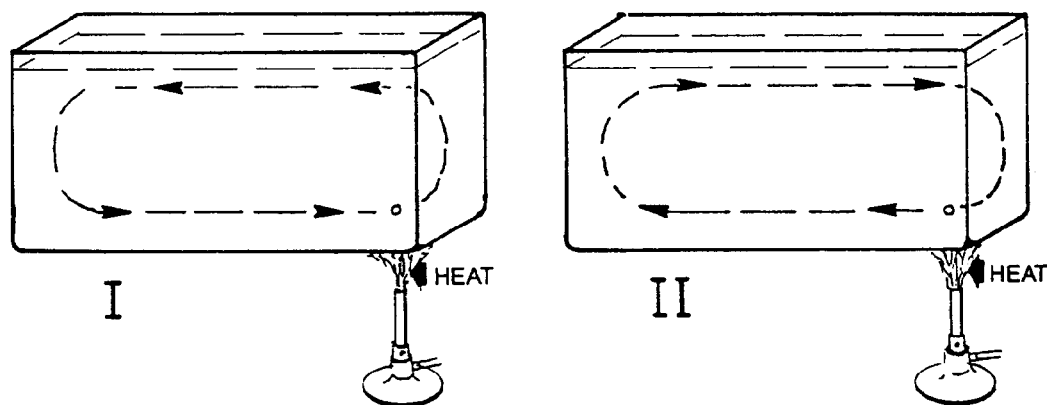
N429701

28. At the present time, where does most of the energy used in this country come from?

- (A) Nuclear reactors
- (B) Hot springs
- (C) Falling waters
- (D) Solar batteries
- (E) Burning of fuels

N406501

29.



Imagine a tiny particle of water in a tank being heated as shown. The particle would probably be moving

- (A) as shown in figure I.
- (B) as shown in figure II.
- (C) sometimes as shown in figure I and sometimes as shown in figure II.
- (D) very little or not at all.

N407601

30. What is the most important advantage resulting from the orbiting space telescope?

- (A) It is closer to the stars than are telescopes on the Earth’s surface.
- (B) It can remain stationary in space, thus focusing on a single object for a longer time.
- (C) It is not affected by distortions caused when light passes through the Earth’s atmosphere.
- (D) It remains at a more constant temperature because of its position in space.

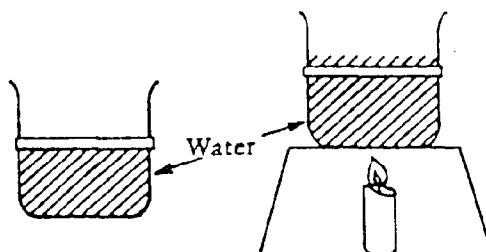
N417401

31. A teaspoon of salt is dissolved in a quart of water. Which *one* of the following is true?

- (A) The salt can be separated out by filtering the solution through a fine cloth.
- (B) The salt grains can be seen in the solution with a microscope.
- (C) The salt will eventually settle out.
- (D) The salt can be separated out by boiling off the water.

N405301

32.

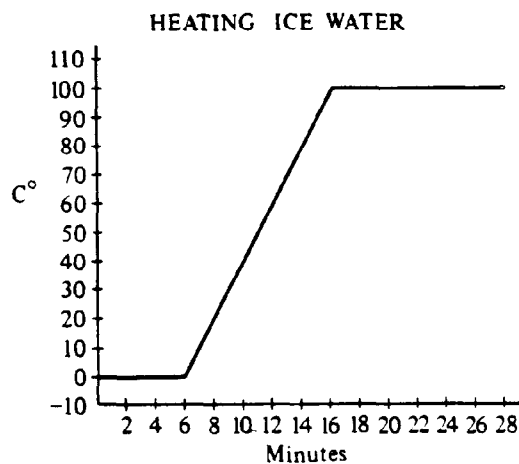


A rubber band is put around a beaker to mark the level of water in the beaker. The beaker is then placed above a burning candle. After a few minutes the level of water is above the rubber band. What best explains this?

- (A) The water molecules have become bigger.
- (B) The average space between the water molecules has increased.
- (C) Water molecules from the air have condensed into the beaker.
- (D) Many of the water molecules have split, making new gases.

N436107

33. A beaker containing crushed ice and water is heated. The temperature of the beaker's contents is recorded every 30 seconds. A graph of the data appears below.



Approximately when does active boiling of the contents of the beaker occur?

- (A) From the beginning of the process
- (B) Between 2 and 6 minutes after the heating begins
- (C) Between 6 and 16 minutes after the heating begins
- (D) After approximately 16 minutes of heating

N418701

34. Concern has been expressed about the greenhouse effect of carbon dioxide, CO_2 , on the Earth's atmosphere. The CO_2 allows sunlight to penetrate to the surface but blocks long-wave infrared radiation from escaping to space. If we continue to burn fuels at an increasing rate, all of the following are likely to occur EXCEPT:

- (A) Atmospheric CO_2 will increase.
- (B) Less heat will be trapped in the atmosphere.
- (C) Sea levels will rise.
- (D) The antarctic ice sheet will become smaller.

N437101

35. A student is doing a project on the effect of a magnet on the picture on a television screen. The student uses only a strong bar magnet, and later writes the following four statements. Which of the following statements does NOT describe an observation?
- (A) The magnet distorts the picture when held near the front of the screen.
- (B) Electrons are attracted by the magnet as they travel through the tube.
- (C) Opposite ends of the magnet produce opposite directions of distortion on the screen.
- (D) The magnet has no effect on the volume of sound.

N425901

36. When phosphorus, P_4 , is exposed to air, it reacts with oxygen, O_2 , to form an oxide, P_4O_{10} . Which one of the following represents the balanced equation for the reaction?
- (A) $P_4 + O_2 \rightarrow P_4O_{10}$
- (B) $P_4 + 10 O_2 \rightarrow P_4O_{10}$
- (C) $4 P_4 + 5 O_2 \rightarrow P_4O_{10}$
- (D) $P_4 + 5 O_2 \rightarrow P_4O_{10}$

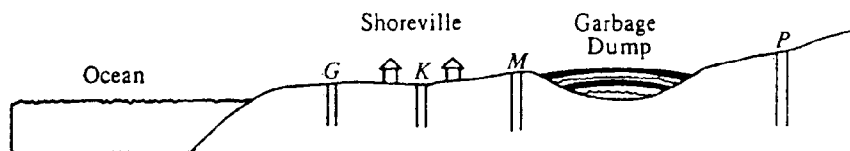
N411801

37. Which of the following objects has the greatest density?

Mass of Object	Volume of Object
(A) 11.0 grams	24 cubic centimeters
(B) 11.0 grams	12 cubic centimeters
(C) 5.5 grams	4 cubic centimeters
(D) 5.5 grams	11 cubic centimeters

N426201

- 38.



The city of Shoreville is considering drilling a well as a source of drinking water at locations G , K , M , or P , shown above. Which of the well sites would be the best choice for the benefit of the community?

- (A) Location P , because there is less chance of contamination and therefore it would be safer.
- (B) Location K , because it is closer to Shoreville and therefore waterlines would be cheaper to construct.
- (C) Location G , because there would be more water and it would serve more people.
- (D) Location M , because buying the land would be easier and less expensive.
39. A weather report will often have statements like "There is a 20% chance of rain tomorrow." What is meant by this forecast?
- (A) In the past, when conditions were similar, it rained the next day about 20% of the time.
- (B) It will rain 20% of the time during the day.
- (C) If it rains tomorrow, we are likely to have about 20/100 inches of rain.
- (D) Weathermen are right about 20% of the time in making such forecasts.
- (E) It will rain over 20% of a given region; for example, a city or a county.

N417901

N409501

40. How do air masses that form over oceans during the winter compare with air masses that form over continents during the winter?

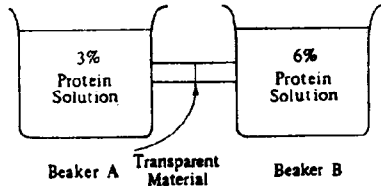
- (A) The air masses that form over oceans are colder and drier than air masses that form over continents.
- (B) The air masses that form over oceans are colder and wetter than air masses that form over continents.
- (C) The air masses that form over oceans are warmer and drier than air masses that form over continents.
- (D) The air masses that form over oceans are warmer and wetter than air masses that form over continents. N408201

41. A student wanted to study the effect of heat on the growth of a particular type of plant. She placed one seedling in each of ten identical pots that contained the same type of soil, and she gave each pot the same amount of water. She then divided the pots into two groups. She placed one group on a window sill where it would be heated by the Sun and placed the other group in a closet on the cool (north) side of her house.

What was wrong with the design of her experiment?

- (A) The temperature difference between the two sets of seeds was not great enough to make a difference.
- (B) Seedlings require light to grow.
- (C) Both heat and light were different for the two groups.
- (D) One group of seedlings was cooler than the other. N425801

42.



The figure above shows two beakers interconnected by a tube that is partitioned by transparent material permeable to water but impermeable to protein. Beaker A contains a 3 percent protein solution and beaker B a 6 percent protein solution.

The function of what structure in living cells is represented by the transparent material in the experiment diagrammed above?

- (A) The cell membrane
- (B) Cytoplasm
- (C) Nucleus
- (D) The cell wall N434202

43. Ten grams of A is added to 8 grams of B, and the container is capped. In the resulting chemical reaction, all of A and all of B are used to produce 6 grams of C and a certain amount of D. Chemicals A, B, C, and D are the only chemicals involved in this reaction. How much D is produced?

- (A) Less than 12 grams
- (B) 12 grams
- (C) More than 12 grams
- (D) It depends on what the chemicals are. N411601

44. The burning of fossil fuels has increased the carbon dioxide content of the atmosphere. What is the most immediate effect that this increasing amount of carbon dioxide is likely to have on our planet?

- (A) A warmer climate
 (B) A cooler climate
 (C) Decreased relative humidity
 (D) Increased relative humidity

N428401

45. Iceland and Southern Greenland are about the same distance from the equator. Many more people live in Iceland where the climate is warmer. What is the best reason for the warmer climate in Iceland?

- (A) Southern Greenland is more mountainous than Iceland.
 (B) Iceland receives more sunlight than Southern Greenland.
 (C) Ocean currents bring warmer water to the coast of Iceland.
 (D) Iceland has more hot springs than Southern Greenland.

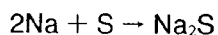
N410201

46. If energy is added to ordinary ice, the ice melts. Which one of the following statements is TRUE?

- (A) When ice melts, a chemical change occurs.
 (B) Liquids are always more stable than solids.
 (C) The energy content of the ice is higher than the energy content of the water.
 (D) Molecules in the ice are arranged in a more orderly way than molecules in the water.

N411701

47.

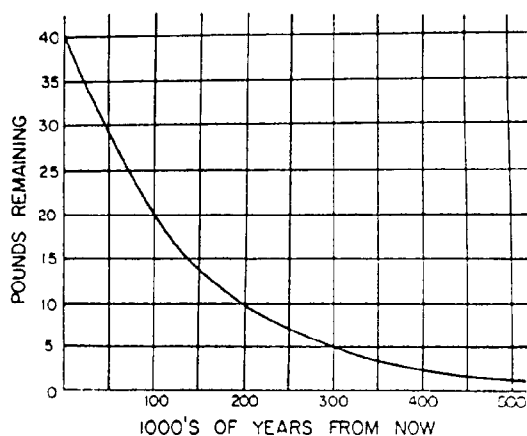


The mass of 1.0 mole of sodium, Na, is 23.0 grams. The mass of 1.0 mole of sulfur is 32.1 grams. Approximately what mass of sodium is required to react completely with 32.1 grams of sulfur in the reaction above?

- (A) 11.5 grams
 (B) 23.0 grams
 (C) 32.0 grams
 (D) 46.0 grams

N433901

48.



A radioactive substance decays into another element. The curve in the graph above shows how much of the radioactive substance remains over time. From the graph, estimate the *half-life* of the substance.

- (A) 50,000 years
 (B) 100,000 years
 (C) 250,000 years
 (D) 500,000 years
 (E) 1,000,000 years

N411901

49. A student was asked to find the percentage of diseased elm trees in a large forest where Dutch elm disease was found. Rather than count every elm tree, the student selected a few representative areas, counted the number of normal and diseased trees, and estimated the number for the entire forest. Which of the following conditions must be met if this technique is to be valid?
- (A) The samples must be restricted to areas where no trees other than elm trees are growing.
 - (B) The samples must be sufficiently large.
 - (C) All the sampling must be done by the same person.
 - (D) The sampling must be repeated over a period of several months.
- N425401
50. Boston is a city at sea level and Denver is over 5,000 feet above sea level. Which of the following is true when 1 liter of pure water is heated to boiling in Denver?
- (A) The boiling point is lower than in Boston.
 - (B) The boiling point is higher than in Boston.
 - (C) It takes longer to heat the water to boiling than in Boston.
 - (D) It takes more energy to heat the water to boiling than in Boston.
- N437301
51. Which of the following is the most important cause of the seasons in the temperate zones of the Earth?
- (A) The Earth's axis is not at right angles to the plane of its orbit.
 - (B) The Earth is not always the same distance from the Sun.
 - (C) The Earth's speed is not constant during the year.
 - (D) The Earth's surface is mostly covered with water.
 - (E) The Earth is not a perfect sphere.
- N408101

ABOUT THIS TEST

Please answer the following questions after you have completed this test. Record your answers in the box at the end of the answer sheet.

- A. How much of the material covered on this test has been taught in your classes?
- B. How difficult was this test for you?
- C. How well do you think you did on this test?
- D. How hard did you work to do well on this test?

WHEN YOU HAVE FINISHED

Please check to make sure you have marked *one* answer for each question. When you have checked your answers place your *Answer Sheet* inside the front cover of the test booklet. All of the booklets will be collected at the same time after everyone is finished. Please sit quietly while others are completing their work.

