

GENERAL SCIENCE

Science Aptitude Test

This is a short version of the three-hour examination recently given to more than 16,000 high school seniors throughout the United States in the annual Science Talent Search.

By HOWARD SIMONS

➤ EARLY IN November of last year, Albert Einstein said that if he had it to do all over again, he would be a plumber or a peddler. If you had it to do all over again and would be an Albert Einstein, you can get some idea of your potential for becoming a scientist by taking this test.

The questions represent a short version of the three-hour Science Talent Search examination, distributed by SCIENCE SERVICE, which was given recently to more than 16,000 high school seniors throughout the United States. For these boys and girls, aspiring to become the nation's top research scientists, the test is the first step in a series of hurdles to be overcome in the annual competition for \$11,000 in Westinghouse Science Scholarships and a trip to the nation's capital, awarded to each of the 40 winners. (See p. 69.)

If you think the test is tough, you are right. It is designed to be tough. It is deliberately made difficult, so that the results of the examination, together with the individual's report on a science project he has or is completing and an evaluation of his scientific ability and personality by his teachers, make it possible for the judges to spot the 40 top and 260 honorable mention science-minded high school students in the United States each year.

In the past 14 years, 183,943 high school seniors have taken the Science Talent Search science aptitude test. Of this number, only 37,551 have been able to complete all the requirements of the Search.

In addition to the \$11,000 awarded each year in Westinghouse Science Scholarships, it is estimated that between 1942, when the first test was given, and 1954, an additional \$4,000,000 in scholarships and financial aid has come to the winners

and honorable mentions from colleges and universities as a direct result of their Search standing.

Colleges, universities and technical schools have found the Science Talent Search of great significance as a means of spotting above-average science students, and from the first they have used it as a way of dispensing scholarships and other financial aid to students on whom they can rely for exceptional achievement.

At the same time, industry and philanthropic organizations have followed the pace set by the Search, and have instituted or expanded their own programs of scholarship and financial aid.

The job of finding potential science talent in this country becomes more urgent each

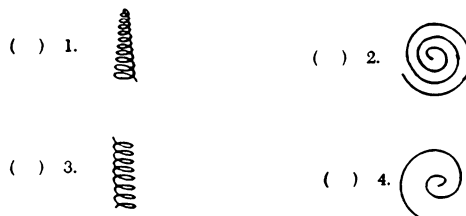
year. Even with a doubling in the number of scientists, technicians and engineers graduated from American universities and colleges since the end of World War II, the technological age has kept the demand well ahead of the supply. This is more than evident as one reads the want ad columns of newspapers in every city and sees the long columns of job offers for both men and women with scientific educations and backgrounds.

There is still another and presently vital reason why science potential in our high schools must be sought after and found. The Soviet Union has made great progress in the numbers of scientists it has trained. So much so, that Russia's increase in the number of scientists, technicians and engineers is now threatening America's technological superiority.

Inadvertently, the need to train specialists for a specialist's world has developed into a feverish race and the United States can no longer rely on a hit-and-miss attitude. The

DIRECTIONS: Four possible answers are given for each question. Put an X in the parentheses in front of the number corresponding to that answer which you think is most nearly correct.

1. A spiral is the locus of a point revolving around a fixed point or line at an ever increasing distance from the point or line. Which of the following is *not* a spiral?



2. Capillaries belong to which system?

() 1. circulatory
() 2. digestive
() 3. muscular
() 4. nervous

3. All of the following are organic except

() 1. alcohol
() 2. aldehyde
() 3. ketone
() 4. lanthanum

4. An apparatus, invented in 1911, is used to study the behavior of alpha particles, electrons, positrons, mesons, photons, and the collision of these particles with atoms. The apparatus contains moist air, which is permitted to expand rapidly, permitting condensation, and the trails of water droplets reveal the paths of the rapidly moving subatomic particles. This apparatus is a

() 1. cloud chamber
() 2. desiccator
() 3. pressure chamber
() 4. vaporizer

5. Which of the following is *least* related to the other three?

() 1. altostratus
() 2. cirrostratus
() 3. geostratus
() 4. nimbostratus

8. The chemical elements 101-103, which do not exist today, will, if and when they are made,

() 1. all be heavy metals
() 2. conform to the pattern displayed by the elements already known
() 3. exist in such microscopic quantities that they cannot be identified
() 4. have to be subjected to experiment before their properties can be described

9. The new field of radio astronomy primarily involves the study of

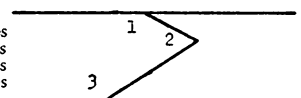
() 1. audible sound
() 2. frequency modulation
() 3. invisible radiation
() 4. visible light

10. The death rate from diseases of the heart and blood vessels increases from January through March. Which of the following reasons has the *least* bearing on the situation?

() 1. Fewer people permit themselves to relax or take vacations in this season.
() 2. More pneumonia, bronchitis, and other illnesses at this season put more strain on heart and circulation.
() 3. The shorter day and greater cloudiness permit less exposure to the beneficial rays of the sun.
() 4. Winter activities call for greater than usual physical exertion, e.g., shovelling snow, pushing stalled cars, stoking the furnace.

11. The sum of the angles 1, 2, and 3 is

() 1. 180 degrees
() 2. 240 degrees
() 3. 360 degrees
() 4. 420 degrees



12. "They travel fast enough to circle the globe at the equator seven times in a second. They permeate nearly everything. They fill the air, they go through houses, and they can even turn corners and drop down into valleys on the far side of hills. However, they cannot go very far beneath the surface of the ground or penetrate the sea." The word "they" must refer to

() 1. heat waves
() 2. infrared waves
() 3. radio waves
() 4. sound waves

DIRECTIONS: Read each Section carefully. The questions following each Section are based on the information given. In other words, the answers to the questions are dependent in some way on the materials of the Section to which they belong. Four possible answers are given for each question. Put an "X" in the parentheses in front of the number corresponding to that answer which you think is **most nearly correct**.

SECTION N

A cube may be rotated about any one of its three axes, a, b, or c. The rotation of the cube 90° about "a" in the direction of the arrow may be denoted by a; the rotation of the cube 90° about "b" in the direction of the arrow by b; and the rotation of the cube 90° about "c" in the direction of the arrow by c.

If operation a is performed twice, the whole operation may be indicated as a²; if three times, as a³; etc. Similarly, the same holds for b and c. If operation b is performed, and then c, the result is bc.

QUESTIONS ON SECTION N

96. After the operation a³b, where is face "A"?

- () 1. back
- () 2. bottom
- () 3. left
- () 4. top

97. Where was the face which is on the bottom after the operation bc before the operation?

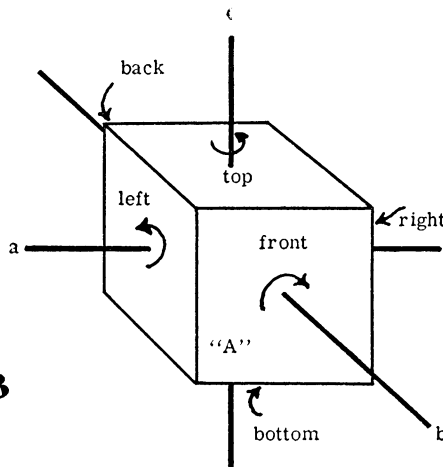
- () 1. back
- () 2. left
- () 3. right
- () 4. top

98. Which operation leaves the cube in the same position as it is after a²b²c²?

- () 1. (bc)²
- () 2. b²c³
- () 3. c⁴
- () 4. c³ba³

102. Mark the largest celestial body 1, the second largest 2, etc., in the order of decreasing size (largest to smallest):

- A. Earth
- B. Jupiter
- C. Mars
- D. Moon
- E. Neptune



PART B

105. Match the following by putting the number of the symbol in Column II in the parentheses in front of the corresponding expression in Column I.

COLUMN I	COLUMN II
() A. $\sqrt{-1}$	1. c
() B. 2.71828	2. e
() C. battery	3. i
() D. electrical condenser	4. ∞
() E. infinity	5. ♂
() F. integral	6. ∫
() G. is greater than	7. ≠
() H. male	8. ♀
() I. resistor	9. ~~~~~
() J. speed of light	10. α
	11. >
	12. Σ
	13. - H
	14. <
	15. Ⓟ

PART C

SCIENCE QUIZ—These questions are part of the three-hour Science Talent Search examination. Try them and then compare your results with those of a random sampling of more than 16,000 high school seniors throughout the United States who took the full length test.

threat of losing the scientific and technological race educating those teen-agers with the ability and interest in a science career looms larger and larger. Effective means for searching out these potential research scientists and aiding them must be applied, if we are to keep ahead of the Soviet Union's vast training program.

The Science Talent Search represents a scientific method of seeking out each year those high school seniors with the greatest aptitude for careers in scientific research. But it does more. In high school after high school, records show that the very existence

of the test and the interest manifested in it, serve as spurs impelling many students toward a study of the sciences.

Ready to test yourself? There are three parts to the short version. You should be able to do the selected parts of the test in a half-hour. Time yourself so that you do not go over 30 minutes and answer all the questions as best you can in one session.

Try the test first, score yourself and then compare your results with those of 177 of the high school seniors who answered the same 15 questions during the three-hour examination. Use the answers shown on p. 77.

These 177 students' answers were selected at random by the graders from the 2,575 tests corrected. This was the number of Search participants that were able to complete all requirements for the competition this year.

Because questions 102 and 105 have multiple answers, a perfect score would be 28 for the 15 questions. If you find that you have answered all the questions of the short

version correctly, then you have done better than any of the 177 students. None of them answered all the 15 questions correctly, nor made a perfect score on the full test. No student has ever made a perfect score, nor is anyone likely to do so.

A high score on the sample test would be 22 or better. Of the 177 sampled papers, 35 students scored this well or better. A low score would be 9 or less. Only 15 of the 177 high school seniors fell into this scoring bracket.

Based on the results of the 177 random samples, the easiest questions were numbers 1, 2, 5, 102D, 105A and 105G. Each of these was answered correctly by more than 150 of the 177 students. Questions 8, 105B, 105F and 105J were the hardest, with less than 80 students being able to answer them correctly.

The very hardest questions of the 15 turned out to be Nos. 8 and 105B which were answered correctly by only 58 of the 177 teen-agers.

When you have compared your results with those of the youngsters, and if you find you have a poor mark, this does not necessarily mean that you are not bright. The examination is not an intelligence test. It is, explain the psychologists

responsible for devising it each year, an aptitude test, designed to find those students with the greatest interest and aptitude for becoming a research scientist.

The 40 high school seniors who come out on top will be in Washington from Feb. 24 through Feb. 28 for the Fourteenth Annual Science Talent Institute. They will meet and talk with leading scientists, visit some of the extensive government research laboratories, hear scientific lectures, and attend a final banquet when the winners of the \$11,000 in scholarships will be announced.

The scholarships can be used at any accredited college or university.

The 40 winners are chosen by Dr. Harold A. Edgerton, New York psychologist; Dr. Stuart Henderson Britt, Chicago psychologist; and Dr. Rex A. Buxton, Washington psychiatrist.

To see the complete aptitude test, send ten cents in coin to SCIENCE SERVICE, 1719 N Street N.W., Washington 6, D. C. Ask for the science aptitude test.