

GENERAL SCIENCE

Test Your Science Aptitude

Determine your science potential with this short version of the two-hour Science Aptitude Examination taken by high school seniors in the 25th annual Science Talent Search.

► FOR ADULTS who wonder how they compare to today's top high school science students, or for high school seniors who for some reason did not enter the 25th Science Talent Search, here is an opportunity to test your science aptitude by means of a short version of the full two-hour science aptitude examination which was given in December to students entering the Silver Anniversary Science Talent Search.

Be prepared for some fascinating but often puzzling questions. Did you ever hear of the Uncertainty Principle? You probably know all about hemophilia, but do you know the melting point of xenon hexafluoride? Before you ask how you could possibly know the melting point of xenon hexafluoride without knowing what xenon hexafluoride is, you should know that none of the high school students in the random sample answered all the questions in this short version correctly.

As the short version of the test has a tenth of the questions in the full-length examination, it is only fair to allow yourself a tenth of the time the students had, so see what you can do in 12 minutes! Then check your answers with those in the answer box on p. 127. Some questions have more than one correct answer, and each answer must be entirely correct to qualify as correct.

The easiest question was 21, answered correctly by 41% of the students. Other questions answered correctly by 25% or more of the students were 3, 22, 56 and 69.

The most difficult questions were 57 and 71, both of which stumped over 90% of the random sample.

If you were disappointed with your showing, be consoled in the knowledge that the random sample of hopeful young science students also scored low. This was the purpose of the test. It was deliberately designed to screen out all but the best among thousands of very able science-oriented students. No one has made a perfect score in the entire 25 years of the Science Talent Search.

Dr. Harold A. Edgerton, Washington psychologist, constructed the 25th Science Aptitude Examination. He also is chairman of the Science Talent Search judging committee.

There is no predetermined "passing" grade. As one of the measuring devices of the Search, the examination is designed to test ability to think and reason in terms of scientific concepts and vocabulary. Scores on this test represent only a part in the judging procedures that select the students who seem most likely to become outstanding research scientists.

Detailed scholastic records of each "pass-
(Continued on p. 127)

PART A

DIRECTIONS: Each question has five possible answers, BUT there may be as many as five right answers for a question. For some questions there will be only one right answer, while others may have two, three, four or five right answers. Put an X in the answer box corresponding to each right answer.

- Heisenberg's Principle of Indeterminacy (also known as the Uncertainty Principle) states that
 - a system of equations in "n" number of variables cannot be solved if "n" exceeds the number of given equations
 - conclusions drawn from biological experimentation cannot be entirely valid because the inherent variability of living organisms introduces an unavoidable factor of indeterminacy
 - it is impossible to specify at any one instant the exact position and velocity of a particle (such as an electron) in space
 - the exact location of stars in the vicinity of the sun cannot be determined by observers on earth because light from those stars is deflected while passing through the gravitational field of the sun
 - the uncertainty (unreliability) of experimental data decreases as the number of separate observations or trials increases

- A cone has a diameter of 20 inches (base) and an altitude of 40 inches. A cord is wrapped spirally around the cone from a point on the base to the apex so that the distance between adjacent windings is 1 1/2 inches. Which is the best estimate of the length of that cord?
 - 219 inches
 - 314 inches
 - 618 inches
 - 863 inches
 - 1015 inches
- Hemophilia is
 - a condition in which the blood's ability to clot is impaired
 - exhibited only by males
 - found in about 10% of the population
 - known as "bleeder's disease"
 - transmitted genetically only by females
- Strabismus refers to
 - astigmatism
 - cross-eyedness
 - glaucoma
 - myopia
 - presbyopia
- The only minor planet which becomes visible to the naked eye is
 - Aquarius
 - Perseus
 - Polaris
 - Shapley
 - Vesta

PART B

DIRECTIONS: In Part B, the questions and answers following each section are based on the information given. Each question has five possible answers, BUT there may be as many as five right answers for a question. For some questions there will be only one right answer, while others may have two, three, four or five right answers. Put an X in the answer box corresponding to each right answer.

SECTION A

The rules for addition in the mod 7 system are the same as those for ordinary addition except that, if the sum is larger than 6, the sum is divided by 7, the quotient discarded, and the remainder is used in place of the ordinary sum. Thus, $6 + 5 \equiv 4 \pmod{7}$. The rules for multiplication in the mod 7 system are also like those of ordinary multiplication except that, if the product is larger than 6, the product is divided by 7 and the remainder is used in place of the ordinary product. Thus: $(6)(3) \equiv 4 \pmod{7}$.

Briefly, $a \equiv b \pmod{7}$ means $a = b + 7k$ for some integer k.

QUESTIONS ON SECTION A

- The mod 7 system requires
 - an infinite number of numerals
 - fractions
 - negative numbers
 - 7 numbers
 - 14 numbers
- What is the value of x in the expression: $2x \equiv 3 \pmod{7}$?
 - $x = 5/2$
 - $x = 3$
 - $x = 5$
 - $x = 6$
 - $x = 7$
- $a \equiv b \pmod{6}$ means
 - $a - b$ is divisible by 6
 - $a \equiv b \pmod{7}$
 - $6a = b$
 - $b = a + 6k$
 - $6b = a$

SECTION E

Ten grams of sodium fluoride in a nickel container were fluorinated with a mixture of xenon fluorides, and all volatile material was removed at 500°C. About 10 grams of XeF₆ containing XeF₄, XeF₂ and XeOF₄ was condensed onto the NaF, and the mixture was warmed at 50°C for

two hours and allowed to remain at room temperature overnight. Fractions volatile at room temperature, at 50° to 55°C and at 125°C were collected and identified by means of their infrared spectrum. The fraction volatile at room temperature was almost exclusively XeOF₄, indicating essentially no binding of XeOF₄ to NaF. At 50°C the volatile material was mainly XeF₂ and XeF₄ with small amounts of XeOF₄. Whether the higher temperature for XeF₂ and XeF₄ collection is required to dissociate weakly bound addition compounds of these materials with NaF or merely to increase the vapor pressure to facilitate collection is not yet established. The infrared spectrum of the fraction collected at 125°C, which contained approximately 8 grams of XeF₆, showed no absorption bands associated with XeOF₄, XeF₄, XeF₂ and HF. Only absorption bands due to XeF₆ were present. While the strong XeF₆ absorption in the region of XeF₄ and XeF₂ absorption bands limits the determination of XeF₄ and XeF₂, the absence of an insoluble residue in the liquid XeF₆ and the low solubility of XeF₄ and XeF₂ in XeF₆ would set an upper limit on the amount of XeF₄ or XeF₂ which could be present.

The melting point of the purified XeF₆ was determined in a sapphire tube attached to a small Hoke valve. The melting point, determined several times on two separate samples, was $47.7 \pm 0.2^\circ\text{C}$, about 1.5°C higher than previously reported. The solid XeF₆ turned yellow at 45° to 43.5°C , melted to a yellow liquid with no insoluble residue, and became colorless on solidification and cooling.

QUESTIONS ON SECTION E

- Which fraction(s) was (were) volatile at 50°C to 55°C?
 - XeF₆
 - XeF₄
 - XeF₂
 - XeOF₄
 - NaF
- The melting point of xenon hexafluoride is
 - greater than for xenon difluoride
 - lower than for xenon tetrafluoride
 - 43°C
 - 43.5°C
 - 47.7°C
- Which of the following statements is (are) correct?
 - XeF₄ boils at about 50°C .
 - XeF₂ did not combine chemically with NaF.
 - XeF₆ left an insoluble residue.
 - XeF₂ is completely soluble in XeF₆.
 - XeOF₄ did not form a compound with NaF.

Copyright © 1965 by Science Service, Inc.

TEST YOURSELF—Compare your own score with those of a random sampling of the thousands of high school seniors who took the full test.

Your Science Aptitude

(Continued from p. 118)

ing" contestant were evaluated. Information offered by the student and his faculty sponsor about his accomplishments, activities, traits and attitudes was weighed carefully to find any of a number of good combinations of achievement and promise.

Each entrant was required to submit a written report of an individual research project. The papers of all the students were read critically by a board of professional scientists, which included specialists in the many fields explored by the student-scientists. This board studied and evaluated reports on computer methods, viruses, planet observations, lasers, complex mathematics, microorganisms and more than a thousand other subjects.

Correlating all of these evaluations, the board of judges selected an Honors Group of 300 students (just over 10% of those with completely qualified entries). These students are being specifically recommended to colleges and universities for admission and scholarship aid, while a list of all students completing entries has been

sent to colleges and universities for their consideration.

The 40 top winners from the Honors Group were selected to attend the Science Talent Institute, March 2 through 7, in Washington, D.C. Each will have interviews with the board of judges and five will be given Westinghouse Science Scholarships ranging from \$7,500 to \$3,000 and the rest awarded \$250 each.

The Science Talent Search is supported by the Westinghouse Educational Foundation and is administered by SCIENCE SERVICE through its Science Clubs of America.

In the 25th Science Talent Search, 25,798 sets of examination materials were requested. There were 2,883 completely qualified entries judged.

During the Science Talent Institute, the 40 winners, in addition to the mutually rewarding experience of learning to know each other, will meet eminent scientists and visit scientific laboratories of national agencies. The Westinghouse scholarships and awards traditionally are announced at the banquet which closes the Institute.

The five scholarships of \$7,500, \$6,000, \$5,000, \$4,000 and \$3,000, and the 35 awards of \$250 each, may be used at any accredited college or university and are intended to assure the professional training of these young pre-scientists.

In addition, 42 states and the District of Columbia conduct State Science Talent Searches in cooperation with Science Clubs of America, awarding more than a half million dollars in scholarships to students from their states who were qualified entrants in the national search.

For a complete aptitude examination, send 15¢ in coins to Science Clubs of America, 1719 N St., N.W., Washington, D.C. 20036 and ask for the test. Or send one dollar for eight different tests, which will include this year's examination.

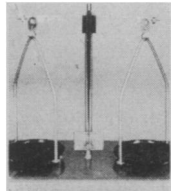
SELLING OUT!

#1300 BALANCE 500 gr. cap. Dutch manufacture. Built for hard usage. Sensitive. Base 15" x 8 1/2". Height 14". Pans 4 3/4" diameter. Anodized finish. Hardened steel bearings. Laboratories, students, jewelers, mineralogists use this balance.

25¢ brings our products bulletin. Now \$12.00 plus 1.00 p.p.

HARRY ROSS

Scientific & Lab. Projects
61-L Reade St., N.Y. 7, N.Y.



The GAME for THINKERS



Can you solve this problem?

1. There are three numbered statements in this box.
2. Two of these numbered statements are not true.
3. The average increase in I.Q. scores of those who learn to play WFF 'N PROOF is more than 20 points.

Is statement No. 3 true?

A NEW DIMENSION IN EDUCATIONAL GAMES
designed by Yale Professor
Layman
E.
Allen



Box 72-FN
New Haven, Connecticut
Please send me . . . WFF 'N PROOF
game/s @ \$6.25 each (including \$.25
for postage and handling). I enclose
\$..... and understand that if I
am not completely satisfied, I can
return the kit in 10 days for a full
refund of the purchase price.

Name
Address
City State Zip

Refund and return privileges guaranteed!
Dealer Inquiries Invited

Science Aptitude Exam Answers

To check yourself, score one point for each entirely correct answer.

PART A: 3-3; 19-4; 20-1, 2, 4, 5;
21-2; 22-5.

PART B: 55-4; 56-3; 57-1, 4; 69-2,
3, 4; 70-5; 71-5.

• Science News Letter, 89:118 February 19, 1966

CHEMISTRY

It Looks Like Concrete But It Stretches, Bends

➤ A NEW MATERIAL that looks and feels like concrete, but which stretches and bends like rubber, has been developed.

Intended as a covering for floors, walls, pavements and other surfaces, the material is claimed to have most of the characteristics of concrete as well as being waterproof, crackproof, acidproof and resistant to wear.

The General Electric Company, which makes it, calls it Traffic Topping. Basically, the material consists of silicon, for abrasion-resistance and durability and rubber for flexibility.

• Science News Letter, 89:127 February 19, 1966

Who needs a \$24⁹⁰ table lighter?



Press to ignite

- Electronic circuitry eliminates flint, wick or nichrome wire
- Instantaneous spark ignition "misers" butane and battery
- Guaranteed leak-proof
- Quality leather body grip in Decorator's Black
- All metal parts brushed stainless steel
- Uses standard butane fuel and transistor battery
- Weight: 18 ozs.
- Height: 4 1/2 in.

Nobody needs it. If all you want is flame, you can make do with matches or a Brand "Z" flintstone lighter. But some (few) people are blessed with a taste for beauty, perfection . . . excellence. They will be interested in the ELECTER that ignites as if by magic: no wheel, no flint, no click, no miss, no flaring flame. The ELECTER is electronic and supremely elegant in design.

You can pay a little more for a lighter almost as good if you drive to Chicago's Loop, New York's Fifth Avenue, or San Francisco's Post Street where you pay for the pleasure of posh surroundings and Etonian accents. But if you wish to pay only for the lighter, we assure you the ELECTER is the ultimate means of producing, without fail, the right-sized flame instantly. What's more, under normal use the ELECTER is guaranteed to light for 2 years (without miss) before replacing the power source. And one year without adding butane. Finally, let it be known there is not another table lighter that looks so distinguished and impressive just sitting there. (We make no apology for romancing good taste. It is something more homes and offices should be on better terms with; don't you think?)

GUARANTEE: Yes; like all the gifts on Haverhill's shelf, the ELECTER is unconditionally guaranteed to please, or your money back.

ORDER NOW FOR HOME AND OFFICE

Mail to: HAVERHILL'S SNL 0219
526 Washington St., San Francisco, Calif. 94111
Please rush me ELECTER electronic
butane table lighters @ \$24.90 each, subject
to stated guarantee.

- My check for \$..... (including \$1.00
for postage and insurance) is enclosed.
 Diners' Amer. Exp. Acct. #.....
Calif. residents add 4% sales tax.

Name

Address

© 1966

Haverhill's
Searching the World to bring you the Finest