GENERAL SCIENCE

Test Your Science Talent

Take this brief test and get some idea of your potential science talent. Test is a short version of the 2½-hour aptitude examination given in 21st Annual Science Talent Search.

➤ IF YOU ARE FOND OF trying to answer tough questions, here is a test that will give you fun and may also give you some insight into abilities that you may not have realized you have.

For instance, is an elephant, giraffe, hippopotamus or zebra, a ruminant? What is an optical maser? For what reason may blood-typing of cattle become as useful as finger-printing?

You can make a quick evaluation of your science talent potential in a few minutes by choosing the best answer to some interesting questions. They are part of the two-and-a-half-hour Science Aptitude Examination given to thousands of high school seniors in December who entered the 21st Science Talent Search for the Westinghouse Science Scholarships and Awards.

For your private testing, allow yourself 20 minutes to complete the sample, then check your answers with those in the answer box, p. 79.

If you are astonished and delighted to find that all of your answers are right, you should be! None of the Science Talent Search contestants did as well as that!

Awarding yourself two points for each of your correct answers in Parts A and B and one point for each correct answer in Part C, a high score on this short version would be at least 24 out of a possible total score of 39. Of the 200 random selections, 24% of the students did this well or better. A low score would be 13 or less. Twenty-six percent of the students were down here at the lower end of the totem pole.

The random sample shows that the easiest questions were 10, 11 and 14. Each of these was answered correctly by 68% or more of the 200 students. Questions 17, 19 and 108-6 were the hardest with each of these drawing correct answers from only 30% or less of the hopeful test-takers.

The most difficult questions apparently were 17 and 19, since only 28% of the students knew that a giraffe is a ruminant and that gibberellic acid is not an animo acid.

The easiest was 10. Nearly 74% found it very simple to choose the right statement about the solar system.

If your score does not look very dazzling when you compare it to the success made by science-oriented students, take comfort in knowing that the test is deliberately designed to screen out all but the best among thousands of very able students. No one ever has made a perfect score in the 21 years of the Search.

Dr. Harold A. Edgerton, New York consulting psychologist and chairman of the Science Talent Search judging committee, constructed the 21st Science Aptitude Examination.

As one of the measuring devices of the

PART A

DIRECTIONS: Four possible answers are given for each question. Choose that answer which is *most nearly correct.*

10. Which of the following statements is *true* for our solar system?
    1. The planetary orbits are pretty well in the same plane.
    2. The planets all travel around the sun with about the same speed.
    3. The planets are practically alike in their physical characteristics except for size.
    4. There are just seven planets rotating about the sun.

11. "Blood-typing of dairy cattle may soon be as effective in identifying cows as fingerprints are in identifying humans." Upon which of the following is this based?
    1. Cattle have the same antigenic factors as do humans.
    2. Percent of solids in the blood provides a basis for unique identification.
    3. Plasma of the blood of cattle contains globules of fat.
    4. Some fifty antigenic factors are the basis for blood types in cattle.

12. An area 600 miles wide and 800 miles long received a snowstorm averaging the equivalent of one inch of rain. If this moisture were all drained into a lake 50 feet deep, about how many square miles would the lake cover?
    1. 500 square miles
    2. 800 square miles
    3. 1,100 square miles
    4. 1,400 square miles

13. A *maxwell* is
    1. a cgs unit of magnetic flux
    2. equal to one BTU per hour
    3. equal to one newton per square meter
    4. a dosage unit used for antibiotics

14. Which one of the following is *not* a stage in the development of the crab?
    1. egg
    2. megalops
    3. pupa
    4. zoca

15. An *optical maser* is
    1. a device for greatly amplifying light
    2. a device for producing polarization
    3. the link between mass and light
    4. the smallest amount of light which can be recognized

16. Gallium-68, useful in the study of uses of coal, is made from
    1. germanium-68
    2. nitrogen
    3. tin
    4. titanium

17. Which of the following animals is a ruminant?
    1. elephant
    2. giraffe
    3. hippopotamus
    4. zebra

18. *Hexadecanol,* in a monomolecular layer, on a reservoir does *not*
    1. diminish wave action
    2. help water to dissolve oxygen
    3. kill microscopic plant life
    4. reduce evaporation

19. Which of the following is *not* an amino acid?
    1. aspartic acid
    2. gibberellic acid
    3. glutamic acid
    4. methionine

PART B

DIRECTIONS: Four possible answers are given for each question. Choose that answer which is *most nearly correct.*

SECTION H

In the diagram, a + b = r, c + d = s

a + c = t, b + d = u, and

a + b + c + d = N

a	b	r
c	d	s
t	u	N

QUESTIONS ON SECTION H

56. Which of the following sets of values makes it possible to determine the value of a?
    1. r, t, N
    2. r, t, d
    3. r, u, d
    4. N, u, s

57. "If only N, s and a are given, one can determine each of the other values in the system." This statement is
    1. true
    2. false
    3. true only when s>N
    4. false only when s<N

58. If the values of r, u and N are given, which other value will enable one to determine each of the remaining values?
    1. c
    2. s
    3. t
    4. at least two other values are required

SECTION R

In his classic work, R. A. Fisher considered the extraction of information from experiments, largely from the point of view of using the correct statistical methods. The experimenter always assumes that it is possible to make valid conclusions from the results of an experiment; that it is possible to argue from effects to causes, or from a particular observation to a general hypothesis. That is, inductive reasoning is involved essentially, after an experimentation has been made: "inductive inference is the only process . . . by which new knowledge comes into the world." The experimental method implies uncertainty, and the subsequent generalization of conclusion and extraction of systematic laws involves inductive reasoning. Such procedure is essentially forward-looking, as opposed to deduction which looks backward and sorts out, reclassifies, or reorientates what we know already. But induction cannot tell us new things with certainty; there is always some margin for error or incompleteness, which subsequent deduction and new experiments assist in clearing up. To some purists there is a certain intellectual unsatisfactoriness about the inductive method, but, nevertheless, in physical science it is a principal method of advance. (There exists even today a Society of Flat-Earthists; they are, of course, perfectly right in refusing to accept any evidence as *proof* that the world is round.) A physical experiment supplies us with information; it assists in narrowing the range of uncertainty of hypothesis. The information gained, concerning a hypothesis, may perhaps be thought of as the ratio of the *a posteriori* to the *a priori* probabilities (strictly, the logarithm of this ratio).

QUESTIONS ON SECTION R

92. Which one of the following statements is *least* supported by this section?
    1. The experimental method deduces cause and effect relationships.
    2. The experimental method offers conclusions based on some uncertainties.
    3. The experimental method precedes inductive processes.
    4. The experimental method provides a basis for generalizations.

93. As discussed in this section, induction is a
    1. method which requires additional experimentation in order to draw valid conclusions
    2. necessary but not a sufficient means for affirming the earth's shape
    3. procedure for inferring systematic laws from particular observations
    4. statistical basis for inferring the validity of experimental observations

94. A critical antecedent of proof is
    1. evidence
    2. hypothesis
    3. law
    4. probability

PART C

105. Write the missing word in the following sentence in the proper place.
"A helium-4 nucleus also goes by the name of _____ particle."

108. Each word in Column I is a scientific term.
For each word in Column I choose the most closely related item listed in Column II. Place the number of the correct item from Column II in the parentheses in front of the related word in Column I.

COLUMN I	COLUMN II
( ) 1. beriberi	1. cell division
( ) 2. blastula	2. club moss
( ) 3. coelacanth	3. formerly believed extinct
( ) 4. deoxyribonucleic acid	4. genes
( ) 5. prophase	5. hormones
( ) 6. thallophyte	6. lichen
	7. stage of embryonic development
	8. thiamin
	9. vitamin A

For a complete aptitude examination, send 15¢ in coins to Science Clubs of America, 1719 N St., N.W., Washington 6, D. C., and ask for the test.

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

Search, it is designed to test ability to think and reason in terms of scientific concepts and vocabulary. Most science-minded high school seniors find the examination challenging and enjoyable to take since it is much like the problems, puzzles and games so many of them delight in solving.

Scores on this test represent only one part in the judging procedures that select the students who seem most likely to become outstanding research scientists. There is no predetermined "passing" grade. In the group of honors winners, the lowest score for boys was 158 and for girls, 130. The highest score among the boys was 228 out of a total possible score of 247. Highest score among the girls, who made up 25% of the entrants, was 204.

Detailed scholastic records of each "passing" 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 is required to submit a written report of an individual research project. This usually amounts to a thousand or so words of text, plus relevant diagrams, graphs, theorems, pictures, etc. 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, fish identification, complex mathematics, astigmatism and more than a thousand other subjects.

Correlating all of these evaluations, the board of judges selected an Honors Group of 356 students (10% of those with completely qualified entries) who showed outstanding scientific potential. To choose 40 top winners from this Honors Group, each detail was reexamined and weighed.

During the Science Talent Institute, to be held March 1 through March 5 in Washington, D. C., the file on each of these 40 will be supplemented by personal interviews. In addition to the mutually rewarding experience of learning to know each other, they will meet eminent scientists, visit scientific laboratories of national agencies, and keep their scheduled appointments for interviews with the judges. 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. Recognition in the Science Talent Search brings many thousands of dollars in other scholarship offers to the Honors Group. In addition, 41 states and the District of Columbia conduct State Science Talent Searches in cooperation with Science Clubs of America, awarding more than half a million dollars in scholarships to students from their states who were qualified entrants in the national Search.

• Science News Letter, 81:70 February 3, 1962

EDUCATION

Federal Role in Education

White House lends its support to a survey of Federal educational programs and a Bill to aid building classrooms, laboratories and libraries, Lillian Levy reports.

➤ A SURVEY of Federal educational programs and their impact on higher education will be undertaken for the first time with full support from the White House.

News of the pioneer study, to be undertaken by Rep. Edith Green (D.-Ore.), chairman of the House Subcommittee on Education, was announced by the Congresswoman in an address before representatives of five major college organizations who met in Washington, D. C., to announce their unified support for specific legislation to provide Federal aid for building college classrooms, laboratories and libraries.

The group backed education bills HR 7215 and HR 8900 which are currently before the House Rules Committee. Rep. Green predicted that there are now enough votes in the Rules Committee to vote out HR 8900 which will provide for optional loans or grants for assistance in the construction of such college facilities. She warned that greater communication between the academicians and members of Congress would be needed if the bill was to get the necessary majority in the House.

A number of the Representatives, "a good 400," have not been close enough to this important problem of education, she observed. Some of the opponents feel that any Federal aid to education imposes undue influence. These opponents do not realize, she emphasized, the tremendous amount of Federal educational aid that presently exists in the form of research grants to colleges and various educational programs. Her investigations show that the Federal Government now is engaged in more than 800 programs in the field of education, involving 40 agencies. Of these the Department of Defense has the largest number of programs—a total of 61—with the Department of Health, Education and Welfare running second with 47 educational programs.

"I don't know of a single person in the Federal Government or in the United States who really knows what the Federal Government is doing in the field of education," she said.

She indicated that as a consequence funds now allocated may be misspent or wasted in either unnecessary programs or duplication. As an example she pointed to the $70,000,000 presently allocated for extension educational programs for rural areas, despite the fact that rural populations are declining.

In welcoming the support of HR 8900 by the educators, Rep. Green noted that the bill limited construction for sectarian instruction only to avoid controversial religious issues. The exclusion of gyms and athletic facilities from Federal support was deliberate, emphasizing the point that a greater need existed for libraries, classrooms and laboratories rather than gysnasiums.

Rep. Green, a former educator, also expressed some misgivings concerning the present emphasis on science and technology as fields of study.

The college groups represented included the American Council on Education, American Association of Junior Colleges, Association of American Colleges, Association of State Universities and Land-Grant Colleges, and the State Universities Association.

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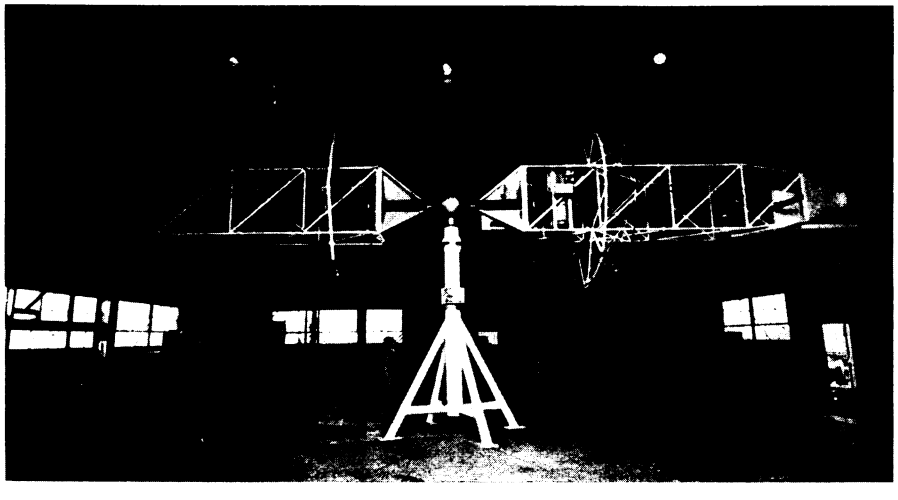

SPACE VEHICLE SIMULATOR—Operating at General Dynamics/Astronautics' Point Loma Test Site, San Diego, Calif., this space vehicle simulator duplicates on the ground the "flight" of the Centaur upper-stage space vehicle in orbit.