

**Iowa End-of-Course
Assessment Programs
Spring 2009 Results**

Math & Science

Prepared at The University of Iowa by Iowa Testing Programs

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Iowa End-of-Course Assessments (IEOC)

Six end-of-course assessments in Algebra 1, Geometry, Algebra 2, Physical Science, Biology, and Chemistry were made available to Iowa schools in the spring of 2009. All Iowa school districts were invited to administer the assessments. Results are reported for the 46 participating public schools, representing 31 districts. Table 1 displays the distribution of district enrollment size. Table 2 describes the student level characteristics of the spring 2009 administration.

Table 1
Distribution of District Size
Spring 2009 IEOC

Enrollment Category	Number of Districts
<250	2
250-399	2
400-599	2
600-999	8
1,000-2,499	8
2,500-7,499	7
7,500+	2

Table 2
Student-level Characteristics
Spring 2009 IEOC

	Algebra 1	Algebra 2	Geometry	Physical Science	Biology	Chemistry
Students by Grade						
6th	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%
8th	9.8%	0.0%	0.2%	0.0%	0.0%	0.0%
9th	68.1%	3.5%	11.6%	74.3%	15.4%	0.0%
10th	21.3%	54.7%	73.2%	21.8%	71.8%	19.9%
11th	0.3%	40.2%	15.1%	3.9%	12.9%	80.1%
12th	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Ethnicity						
African American	0.2%	0.2%	0.2%	0.1%	0.2%	0.1%
American Indian or Alaskan Native	2.5%	2.6%	2.6%	3.1%	2.7%	2.4%
Asian	2.6%	1.5%	2.0%	2.5%	2.6%	1.7%
Hispanic or Latino	5.8%	5.0%	5.6%	8.6%	6.3%	5.5%
Hawaiian/Pacific Islander	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
White	84.8%	90.0%	87.6%	84.8%	87.8%	89.9%
Other	0.4%	0.4%	0.2%	0.3%	0.1%	0.0%
No response	3.7%	0.4%	1.7%	0.5%	0.2%	0.3%
Gender						
Female	50.8%	49.9%	49.8%	49.7%	47.5%	54.0%
Male	49.2%	50.1%	50.3%	50.3%	52.6%	46.0%

A single form was available in each of the six subject areas. Each form contained 30 multiple choice items. The range of performance, mean, median, standard deviation, and quartile values for each subject area test are provided in Table 3.

Table 3
Raw Score Descriptive Information by Test
Spring 2009 IEOC

	Algebra 1	Algebra 2	Geometry	Chemistry	Biology	Physical Science
N	3345	2230	2667	2453	3566	1685
Score Range	2 - 30	0 - 30	3 - 30	5 - 30	2 - 30	3 - 30
Mean	14.5	14.6	19.0	17.5	18.4	16.2
SD	5.3	5.6	5.8	4.8	5.2	5.0
90th percentile	22	23	27	24	25	23
75th percentile	18	18	24	21	22	20
Median	14	14	19	17	19	16
25th percentile	10	10	15	14	15	12
10th percentile	8	8	11	11	11	10

Each of the IEOC test consisted of four to six content stands. Each content strand was represented by a limited number of items ranging from 2 to 14. A summary of performance by content stand is provided in Table 4.

Table 4
Descriptive Information by Test and Content Strand
Spring 2009 IEOC

Algebra 1

	Basic Algebra	Linear Equations and Inequalities	Systems of Linear Equations and Inequalities	Polynomials
Form B				
Number of Items	11	4	5	10
Score Range	0-11	0-4	0-5	0-10
Mean	6.30	1.75	2.11	4.31
Median	6	2	2	4
SD	2.23	1.01	1.24	2.33

Algebra 2

	Foundations of Algebra	Quadratics	Functions	Complex Numbers
Form A				
Number of Items	11	4	12	3
Score Range	0-11	0-4	0-12	0-3
Mean	5.72	2.54	5.30	1.07
Median	6	3	6	1
SD	2.42	1.12	2.62	0.99

**Descriptive Information by Test and Content Strand
Spring 2009 IEOC**

Geometry

	Points, Lines and Planes	Triangles	Other Polygons and Solid Figures	Circles	Transformations
Form A					
Number of Items	5	7	11	4	3
Score Range	0-5	0-7	0-11	0-4	0-3
Mean	3.56	5.13	6.58	2.10	1.60
Median	4	5	7	2	2
SD	1.17	1.60	2.39	1.17	0.99

Biology

	Molecular Basis of Heredity	Behavior of Organisms	Interdependence of Organisms, Matter, Energy, and Organization in Living Systems	Biological Evolution	The Cell
Form B					
Number of Items	9	5	5	4	7
Score Range	0-9	0-5	0-5	0-4	0-7
Mean	4.81	3.72	2.81	2.75	4.28
Median	5	4	3	3	4
SD	1.84	1.35	1.36	1.10	1.55

**Descriptive Information by Test and Content Strand
Spring 2009 IEOC**

Chemistry

	Conservation of Energy and Increase in Disorder	Structure of Atoms	Structure and Properties of Matter	Chemical Reactions
Form A				
Number of Items	2	3	14	11
Score Range	0-2	0-3	0-14	0-11
Mean	1.27	1.77	7.89	6.61
Median	1	2	8	7
SD	0.63	0.90	2.57	2.09

Physical Science

	Motion and Forces	Structure and Properties of Matter	Conservation of Energy and Increase in Disorder	Structure of Atoms	Interactions of Energy and Matter	Chemical Reactions
Form A						
Number of Items	11	5	6	3	3	2
Score Range	0-11	0-5	0-6	0-3	0-3	0-2
Mean	7.01	1.87	3.21	1.59	1.29	1.12
Median	7	2	3	2	1	1
SD	2.12	1.30	1.50	0.94	0.85	0.73

Algebra I Descriptions

Basic Algebra:

Topics may include number systems and properties, variable expressions, equations, inequalities, and functions

Linear equations and inequalities:

Topics may include equation of a line, parallel and perpendicular slopes, and graphs of lines and inequalities on the coordinate plane

Systems of linear equations and inequalities:

Topics may include systems of equations that can be solved by substitution, elimination, or graphing; and graphs of systems of equations and inequalities on the coordinate plane

Polynomials:

Topics may include arithmetic with polynomials, simplification of polynomials, solving polynomials by factoring or the Quadratic Formula, and graphs of polynomials

Algebra II Descriptions

Foundations of Algebra:

Topics may include radicals and exponents; absolute value equations and inequalities; linear equations and inequalities; and systems of linear equations and inequalities

Quadratics:

Topics may include solving quadratics by factoring or the Quadratic Formula, and graphs of quadratic equations

Functions:

Topics may include polynomials and rational functions; logarithms, exponential functions, and logarithmic functions; composite functions; inverse functions; step and piecewise functions

Complex numbers:

Topics may include arithmetic with complex numbers, complex conjugates, and simplifying to $a + bi$ form

Geometry Descriptions

Points, lines, and planes:

Topics may include points on the coordinate plane, angles formed by intersecting lines, angles formed by parallel lines cut by transversals, vertical angles, complementary and supplementary angles

Triangles:

Topics may include properties, special triangles, Pythagorean Theorem, congruence, and similarity

Other polygons and solid figures:

Topics may include properties, similarity, perimeter, area, surface area, and volume

Circles:

Topics may include circumference, area, sectors, tangents, and arc length

Transformations:

Topics may include dilation, reflection, rotation, and translation

Biology Strand Descriptions

The cell:

Cell types, cell components and their functions, cell membranes (absorption and transport), the cell cycle, mitosis, cell differentiation, photosynthesis, cellular respiration, enzymes as catalysts of biological reactions

Molecular basis of heredity:

DNA, RNA, DNA replication, transcription, translation, sexual reproduction, gametes, meiosis, fertilization, genes, alleles, Mendel's laws, Punnett square, genotype, phenotype, mutations

Biological evolution:

Diversity of organisms, descent from common ancestors, natural selection, survival and reproductive success, genetic variation, biological classification, binomial nomenclature

Interdependence of organisms/Matter, energy, and organization in living systems:

Cycling of materials, symbiotic interactions, competition, predation, population, community, food chains, food webs, energy flow through trophic levels, effects of environmental factors and finite resources, impact of human activities on ecosystems, the Sun as the primary source of energy for life, energy aspects of photosynthesis and cellular respiration, ATP, conservation of matter and energy, levels of biological organization

Behavior of organisms:

Nerve cell structure and function, neurotransmitters, CNS and PNS, ectothermy and endothermy, innate behavior, learning, behavioral responses to external and internal stimuli, plant behavior, human immune system, human endocrine system and hormones

Chemistry Strand Descriptions

Structure of atoms:

Masses, charges, and locations of protons, neutrons, and electrons in an atom; atom volume, atomic number, mass number, isotopes, decay, half-life, nuclear forces, fission, fusion

Structure and properties of matter:

Atomic mass, valence electrons, periodic table and trends, ionic and covalent bonding, mole, molar mass, physical and chemical properties of substances, states of matter, gas laws

Chemical reactions:

Reaction components, writing and balancing chemical equations, types of chemical reactions, thermochemistry, conservation of mass, acids and bases, electrochemistry, radical reactions, kinetics and equilibrium, stoichiometry, catalysts

Conservation of energy and increase in disorder:

Work and energy, conservation of energy, types of energy, heat and temperature, thermal properties of matter, kinetic theory of gases, entropy, energy transformations, energy transfers, thermodynamics

Physical Science Strand Descriptions

Structure of atoms:

Masses, charges, and locations of protons, neutrons, and electrons in an atom; atom volume, atomic number, mass number, isotopes, decay, half-life, nuclear forces, fission, fusion

Structure and properties of matter:

Atomic mass, valence electrons, periodic table and trends, ionic and covalent bonding, mole, molar mass, physical and chemical properties of substances, states of matter, gas laws

Chemical reactions:

Reaction components, writing and balancing chemical equations, types of chemical reactions, thermochemistry, conservation of mass, acids and bases, electrochemistry, radical reactions, kinetics and equilibrium, stoichiometry, catalysts

Motions and forces:

Newton's laws, gravity, mass versus weight, force, speed, velocity, acceleration, momentum, buoyancy, electricity and magnetism

Conservation of energy and increase in disorder:

Work and energy, conservation of energy, types of energy, heat and temperature, thermal properties of matter, kinetic theory of gases, entropy, energy transformations, energy transfers, thermodynamics

Interactions of energy and matter:

Light, sound, wave properties, wave phenomena, electromagnetic spectrum, conductors and insulators, electrical circuits, spectroscopy