Science Assessment Targets

Content Specifications for the GED® Science Test

The GED® Science Test will focus on the fundamentals of science reasoning, striking a balance of deeper conceptual understanding, procedural skill and fluency, and the ability to apply these fundamentals in realistic situations. In order to stay true to this intention, each item on the Science Test will be aligned to one *science practice* and one *content topic*.

The science practices can be described as skills that are key to scientific reasoning in both textual and quantitative contexts. The science practices are derived from important skills enumerated in the career- and college-readiness standards as well as in The National Research Council's Framework for K-12 Science Education.

The Science Test will also focus on three major content domains: life science, physical science, and Earth and space science. The science content topics, which are drawn from these three domains, will provide context for measuring a test-taker's abilities to apply the reasoning skills described in the practices. The content topics focus on science that reflects both that which is taught in many high school-level science courses and that which is most relevant and useful for an adult population. To measure this content at a range of levels of complexity, several different item types will be used in the test, including multiple choice, short answer, drag-and-drop, hot spot, and fill-in-the-blank.

Given these priorities, the GED® Science Test adheres to the following parameters:

1. Approximately 40 percent of the test will focus on life science, roughly 40 percent will focus on physical science, and approximately 20 percent will focus Earth and space science.

2. The test will include items that test textual analysis and understanding, data representation and inference skills, as well as problem solving with science content.

3. Each item on the Science Test will be aligned to both one science practice and one content topic.

About the assessment: The science assessment targets are divided into two sections: the practices and the content topics. The science practices describe skills necessary for reasoning in a scientific context, while the content topics describe a body of knowledge typical of what is taught in American high schools. Items on the GED® Science Test will be aligned to one science practice indicator and one content subtopic each.

4. Each item will also be aligned to one Depth of Knowledge level of cognitive complexity, based on the appropriate alignment to a science practice.
5. Approximately 80 percent of the items will be written to a Depth of Knowledge level of 2 or 3; DOK level 4 is beyond the scope of the GED® test.
6. The contexts within which problem solving skills will be measured will be taken from both academic and workforce contexts.
7. Approximately 50 percent of the items will be presented in item scenarios, in which a single stimulus (which may be textual, graphic or a combination of both) serves to inform two to three items. The rest of the items will be discrete (i.e. standalone) items.

About the assessment: Each science practice in the Science Assessment Targets correspond with standards from Common Core State Standards (CCSS) for Literacy in Science & Technical Subjects, and mathematics and/or practices from *A Framework for K-12 Science Education.*

For example, R.1 corresponds with CCSS Reading Anchor Standard 1m and 8.SP refers to skills introduced in the CCSS Grade 8 Statistics and Probability mathematics domain. Practices 1-8, however, are drawn from the scientific practices in *A Framework for K-12 Science Education.*

Click for more information about:

Common Core Standards for ELA and Literacy

Common Core State Standards for Mathematics

Scientific Practices in A Framework for K-12 Science Education

References to Common Core State Standards and Framework for K-12 Science Education[25]	Science Practices	Range of Depth of Knowledge (DOK) levels[26]
	SP.1 Comprehending Scientific Presentations	
R2, R8, P8, M2, M6	SP.1.a Understand and explain textual scientific presentations	1-3
R4, L4, P8,M2, M4, M6	SP.1.b Determine the meaning of symbols, terms and phrases as they are used in scientific presentations	2
S-ID, 8.SP, P8, M2, M4, M6	SP.1.c Understand and explain a non-textual scientific presentations	2
	SP.2 Investigation Design (Experimental and Observational)	
R8, P3, P4, M4	SP.2.a Identify possible sources of error and alter the design of an investigation to ameliorate that error	2-3
R2, R5, W5, P1, P8. M, M4, M8	SP.2.b Identify and refine hypotheses for scientific investigations	2-3
R8, R9, P2, P5, M3, M4	SP.2.c Identify the strength and weaknesses of one or more scientific investigation (i.e. experimental or observational) designs	2-3
W7, 3.MD, P3, P5, M4, M8	SP.2.d Design a scientific investigation	1-3
R5, P2, P4, M4	SP.2.e Identify and interpret independent and dependent variables in scientific investigations	2-3
	SP.3 Reasoning from Data	
R1, P7,	SP.3.a Cite specific textual evidence to support a finding or conclusion	2-3
R1, R2, R3, P1, P6, P7, M3, M4, M7, M8	SP.3.b Reason from data or evidence to a conclusion	2-3
R1, R3, P4, M3, M4, M7, M8	SP.3.c Make a prediction based upon data or evidence	2-3
S-CP, 7.SP, P4, P5, M4, M7, M8	SP.3.d Using sampling techniques to answer scientific questions	2-3
	SP.4 Evaluating Conclusions with Evidence	
R8, P4, P6, M3, M7, M8	SP.4.a Evaluate whether a conclusion or theory is supported or challenged by particular data or evidence	2-3
	SP.5 Working with Findings	
R9, P2, P4, P6, M3, M7	SP.5.a Reconcile multiple findings, conclusions or theories.	2-3
	SP.6 Expressing Scientific Information	
R7, W2, P8, M2, M4, M6	SP.6.a Express scientific information or findings visually	2
R7, W2, P5, P8, M2, M4, M6	SP.6.b Express scientific information or findings numerically or symbolically.	1-2
R7, W2, P8, M2, M6	SP.6.c Express scientific information or findings verbally	2-3

25 The GED® Science Practices (SP#) are derived from The Common Core State Standards for ELA and Literacy (R#) (L#) (W#)(2010), The Common Core State Standards for Mathematics (M#) (2010), and the National Research Council's A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas (P#) (forthcoming).

26 The Depth of Knowledge (DOK) levels correspond to Norman Webb's (University of Wisconsin) *Depth of Knowledge* model of cognitive complexity.

References to Common Core State Standards and Framework for K-12 Science Education[25]	Science Practices	Range of Depth of Knowledge (DOK) levels[26]
	SP.7 Scientific Theories	
R3, R5, L3, P1, P2, P7, M2, M4	SP.7.a Understand and apply scientific models, theories and processes	2-3
P2, P5, M2, M4, M8	SP.7.b Apply formulas from scientific theories	2
	SP.8 Probability & Statistics	
S-MD, S-ID, P4, P5, M4, M6	SP.8.a Describe a data set statistically	1-2
7.SP, P5, M4, M6	SP.8.b Use counting and permutations to solve scientific problems	1-2
7.SP, S-CP, P5, M4, M6	SP.8.c Determine the probability of events	2

To learn more about the reference column, see Appendix B.

25 The GED® Science Practices (SP#) are derived from The Common Core State Standards for ELA and Literacy (R#) (L#) (W#)(2010), The Common Core State Standards for Mathematics (M#) (2010), and the National Research Council's A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas (P#) (forthcoming).

26 The Depth of Knowledge (DOK) levels correspond to Norman Webb's (University of Wisconsin) *Depth of Knowledge* model of cognitive complexity.

2014 GED® Test Science Content Topics

The science content topics describe key concepts that are widely taught in a variety of high school-level courses and are relevant to the lives of GED® test-takers. The content topics are designed to provide context for measuring the skills defined in the science practices section of this document.

As in the previous version of the GED® Science Assessment Targets, the science practices maintain a close relationship with the science content topics. More specifically, the primary focus of the GED Science Test continues to be the measurement of essential reasoning skills applied in scientific context. However, test-takers should still be broadly and generally familiar with each of the basic concepts enumerated in the science content topics and subtopics, and they should be able to recognize and understand, in context, each of the terms listed there. Nevertheless, test-takers are not expected to have an in-depth and comprehensive knowledge of each subtopic. Rather, the stimuli about which each question pertains will provide necessary details about scientific figures, formulas, and other key principles. For example, a question may include answer options and stimuli that contain specific terms drawn from the content subtopics; however, test-takers will never be asked to formulate their own definition a term without the item providing sufficient contextual support for such a task.

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Focusing Themes

These themes have been selected to ensure that the test covers a wide range of important scientific topics, but they are also intended to function like a lens by drawing focus to a distinct subset of ideas within each content topic. That is, items from any of the three content domains of life science, physical science, and Earth and space science can pertain to one of these two themes, but content that falls outside the spheres of these themes will not appear on the Science Test.

- **Human Health and Living Systems**, the first focusing theme, pertains to material that is vital for the health and safety of all living things on the planet. Topics explored in this area of focus include the physical body and characteristics of humans and other living things. System of living organisms and related topics (e.g. diseases, evolution, and heredity) are also

covered. This crosscutting concept also examines the mechanisms for how the human body works on chemical and physical levels. Within the domain of Earth and space science, topics are focused on how the environment affects living things and human society, as well as on how humans and other organisms affect the environment.

- **Energy and Related Systems**, the second focusing theme, deals with a fundamental part of the universe. Topics in this area of focus will cover sources of energy, transformations of energy, and uses of energy. Within the domain of life science, this theme will be reflected in content exploring how energy flows through organisms and ecosystems. Similarly, the Earth's geochemical systems will be touched upon in Earth and space science. Topics related to how humans gain energy in their bodies and the results of the use of that energy are also relevant to this theme.

The Science Content Topics Matrix below identifies the major topics in science and shows the relationship between each content topic and each focusing theme.

Science Content Topics Matrix

		Science Content Topics		
		Life Science (L) (40%)	Physical Science (P) (40%)	Earth and Space Science (ES) (20%)
Focusing Themes	**Human Health and Living Systems**	a. Human body and health b. Organization of life (structure and function of life) c. Molecular basis for heredity d. Evolution	a. Chemical Properties and Reactions Related to Human Systems	a. Interactions between Earth's systems and living things
	Energy and Related Systems	e. Relationships between life functions and energy intake f. Energy flows in ecologic networks (ecosystems)	b. Conservation, transformation, and flow of energy c. Work, motion, and forces	b. Earth and its system components and interactions c. Structure and organization of the cosmos

The science content topics and subtopics tables on the following pages break down each content topic into greater detail. Individual test items will be drawn from the subtopics.

Science Content Topics and Subtopics[27]

Life Science	
L.a	**Human Body and Health** L.a.1 Body systems (e.g. muscular, endocrine, nervous systems) and how they work together to perform a function (e.g. muscular and skeletal work to move the body) L.a.2 Homeostasis, feedback methods that maintain homeostasis (e.g. sweating to maintain internal temperature), and effects of changes in the external environment on living things (e.g. hypothermia, injury) L.a.3 Sources of nutrients (e.g. foods, symbiotic organisms) and concepts in nutrition (e.g. calories, vitamins, minerals) L.a.4 Transmission of disease and pathogens (e.g. airborne, bloodborne), effects of disease or pathogens on populations (e.g. demographics change, extinction), and disease prevention methods (e.g. vaccination, sanitation)
L.b	**Relationship Between Life Functions and Energy Intake** L.b.1 Energy for life functions (e.g. photosynthesis, respiration, fermentation)
L.c	**Energy Flows in Ecologic Networks (Ecosystems)** L.c.1 Flow of energy in ecosystems (e.g. energy pyramids), conservation of energy in an ecosystem (e.g. energy lost as heat, energy passed on to other organisms) and sources of energy (e.g. sunlight, producers, lower level consumer) L.c.2 Flow of matter in ecosystems (e.g. food webs and chains, positions of organisms in the web or chain) and the effects of change in communities or environment on food webs L.c.3 Carrying capacity, changes in carrying capacity based on changes in populations and environmental effects and limiting resources to necessary for growth L.c.4 Symbiosis (e.g. mutualism, parasitism, commensalism) and predator/prey relationships (e.g. changes in one population affecting another population) L.c.5 Disruption of ecosystems (e.g. invasive species, flooding, habitat destruction, desertification) and extinction (e.g. causes [human and natural] and effects)
L.d	**Organization of Life (Structure and Function of Life)** L.d.1 Essential functions of life (e.g. chemical reactions, reproduction, metabolism) and cellular components that assist the functions of life (e.g. cell membranes, enzymes, energy) L.d.2 Cell theory (e.g. cells come from cells, cells are the smallest unit of living things), specialized cells and tissues (e.g. muscles, nerve, etc.) and cellular levels of organization (e.g. cells, tissues, organs, systems) L.d.3 Mitosis, meiosis (e.g. process and purpose)

27 The GED® Science Content Topics are informed by the National Research Council's *A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas* 2011.

Life Science	
L.e	**Molecular Basis for Heredity** L.e.1 Central dogma of molecular biology, the mechanism of inheritance (e.g. DNA) and chromosomes (e.g. description, chromosome splitting during Meiosis) L.e.2 Genotypes, phenotypes and the probability of traits in close relatives (e.g. Punnett squares, pedigree charts) L.e.3 New alleles, assortment of alleles (e.g. mutations, crossing over), environmental altering of traits, and expression of traits (e.g. epigenetics, color-points of Siamese cats)
L.f	**Evolution** L.f.1 Common ancestry (e.g. evidence) and cladograms (e.g. drawing, creating, interpreting) L.f.2 Selection (e.g. natural selection, artificial selection, evidence) and the requirements for selection (e.g. variation in traits, differential survivability) L.f.3 Adaptation, selection pressure, and speciation

Physical Science	
P.a	**Conservation, Transformation, and Flow of Energy** P.a.1 Heat, temperature, the flow of heat results in work and the transfer of heat (e.g. conduction, convection) P.a.2 Endothermic and exothermic reactions P.a.3 Types of energy (e.g. kinetic, chemical, mechanical) and transformations between types of energy (e.g. chemical energy [sugar] to kinetic energy [motion of a body]) P.a.4 Sources of energy (e.g. sun, fossil fuels, nuclear) and the relationships between different sources (e.g. levels of pollutions, amount of energy produced) P.a.5 Types of waves, parts of waves (e.g. frequency, wavelength), types of electromagnetic radiation, transfer of energy by waves, and the uses and dangers of electromagnetic radiation (e.g. radio transmission, UV light and sunburns)
P.b	**Work, Motion, and Forces** P.b.1 Speed, velocity, acceleration, momentum, and collisions (e.g. inertia in a car accident, momentum transfer between two objects) P.b.2 Force, Newton's Laws, gravity, acceleration due to Gravity (e.g. freefall, law of gravitational attraction), mass and weight P.b.3 Work, simple machines (types and functions), mechanical advantages (force, distance, and simple machines), and power
P.c	**Chemical Properties and Reactions Related to Living Systems** P.c.1 Structure of matter P.c.2 Physical and chemical properties, changes of state, and density P.c.3 Balancing chemical equations and different types of chemical equations, conservation of mass in balanced chemical equations and limiting reactants P.c.4 Parts in solutions, general rules of solubility (e.g. hotter solvents allow more solute to dissolve), saturation and the differences between weak and strong solutions

Earth and Space Science	
ES.a	**Interactions between Earth's Systems and Living Things** ES.a.1 Interactions of matter between living and non-living things (e.g. cycles of matter) and the location, uses and dangers of fossil fuels ES.a.2 Natural Hazards (e.g. earthquakes, hurricanes, etc.) their effects (e.g. frequency, severity, and short- and long-term effects), and mitigation thereof (e.g. dikes, storm shelters, building practices) ES.a.3 Extraction and use of natural resources, renewable vs. non-renewable resources and sustainability
ES.b	**Earth and its System Components and Interactions** ES.b.1 Characteristics of the atmosphere, including its layers, gases and their effects on the Earth and its organisms, including climate change ES.b.2 Characteristics of the oceans (e.g. salt water, currents, coral reefs) and their effects on Earth and organisms ES.b.3 Interactions between Earth's systems (e.g. weathering caused by wind or water on rock, wind caused by high/low pressure and Earth rotation, etc.) ES.b.4 Interior structure of the Earth (e.g. core, mantle, crust, tectonic plates) and its effects (e.g. volcanoes, earth quakes, etc.) and major landforms of the Earth (e.g. mountains, ocean basins, continental shelves, etc.)
ES.c	**Structures and Organization of the Cosmos** ES.c.1 Structures in the universe (e.g. galaxies, stars, constellations, solar systems), the age and development of the universe, and the age and development of Stars (e.g. main sequence, stellar development, deaths of stars [black hole, white dwarf]) ES.c.2 Sun, planets, and moons (e.g. types of planets, comets, asteroids), the motion of the Earth's motion and the interactions within the Earth's solar system (e.g. tides, eclipses) ES.c.3 The age of the Earth, including radiometrics, fossils, and landforms