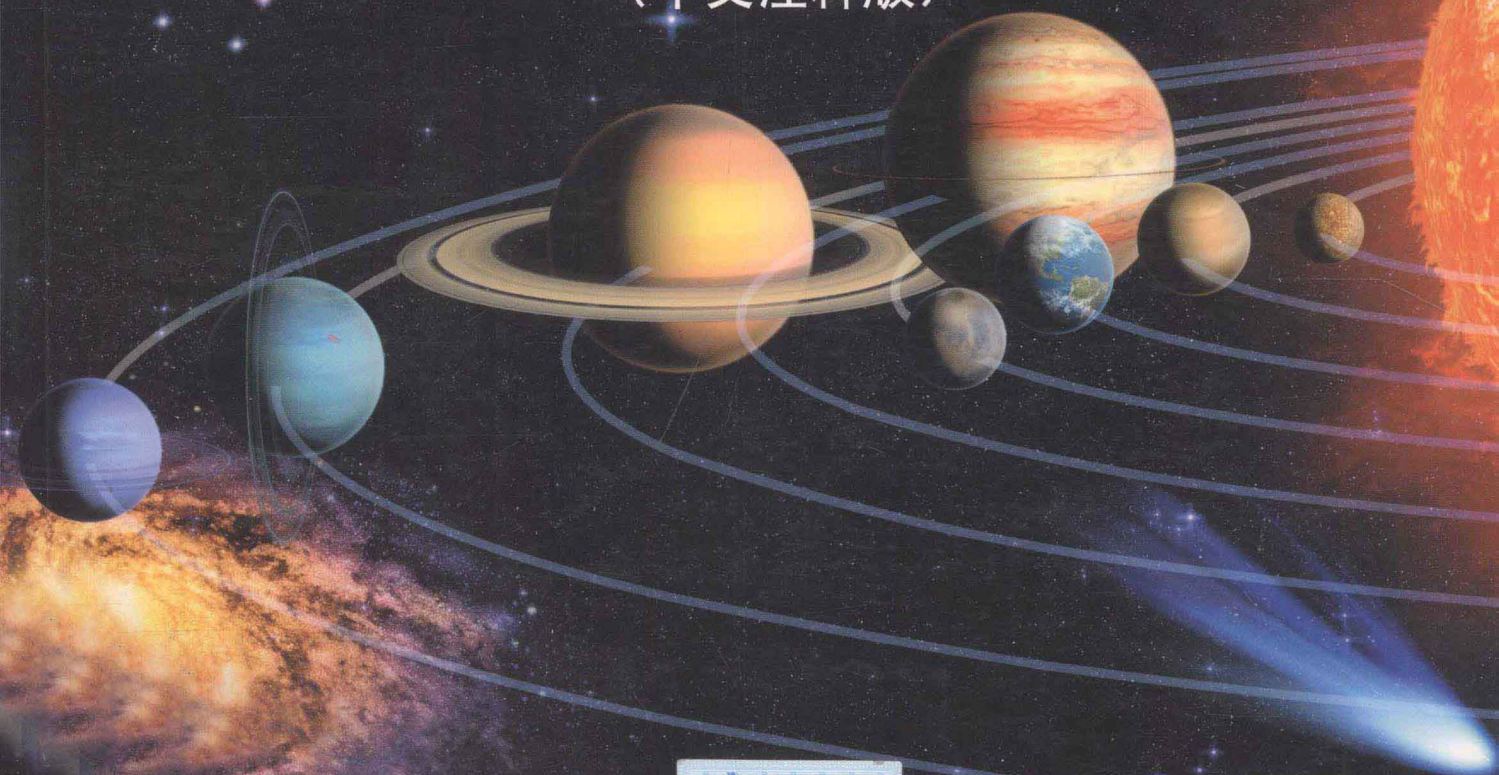


GATEWAY to SCIENCE

VOCABULARY AND CONCEPTS

科学英语入门

(中文注释版)

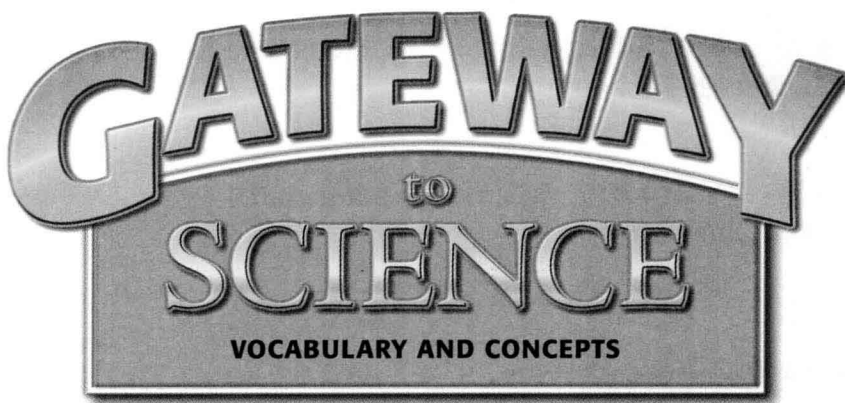


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科学英语入门

(中文注释版)

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Gateway to Science

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出版前言

《科学英语入门》是全球最大的教育集团之一圣智（Cengage Learning）为美国小学高年级至中学阶段学生出版的科普英语学习用书，按主题编写，包括4个大主题：科学工作基本常识（Science Basics）、生命科学（Life Science）、地球科学（Earth Science）和物理科学（Physical Science）。大主题下收录了55个相关的小主题，每个小主题占4个页面，由11个小板块组成，详见本书第xx~1页上的介绍。

《科学英语入门》在我国最适合的读者是中学生。为了更好地满足中国读者的需要，中文注释版在原版基础上做了一些本地化工作。首先，我们为目录中的题名和第xx~1页上的介绍文字提供了中文注释或译文，但对书中其他标题则一律不再翻译或加注，以免注释过于繁琐，主次不分。其次，我们为每个小主题词汇表中的词汇以及“阅读”和“科学技能”这两个板块中的黑体词提供了注音和中文注释。黑体词的中文注释每页自成一个板块，大都置于翻口处，以“中文注释：”引出，全部用蓝色字。中文注释编号与黑体词上标编号一致。第三，我们为书后总词表中的词提供了国际音标和汉语对应词。第四，对元素周期表中各元素，我们提供了汉语译名，而且为了便于读者检索和记忆，我们还增加了按字母排序的化学元素表，并同时提供英文注音、汉语译名以及译名的拼音。书中注音均为美式发音。因录音朗读者个人发音习惯有异，有些单词在词汇表中的读音与在短文中不同，对此，我们只注词典中常用的美式发音。

由于科技日益引领生活，科学素养也日渐受到教育界的重视，有的省市还定期举办旨在促进科学知识和英语学习的科普英语竞赛，图书市场也应运而生一批科普英语读物。这些读物有些也按主题编写，部分也做得比较成功。与之相比，《科学英语入门》（中文注释版）有以下几点值得推荐：

首先，它采用了庇护教学法的理念，在文章之前先提供关键词及其读音和汉语释义，然后以短文来体现关键词的意义和用法，以此减少学习者在随后学习中的障碍，从而降低他们的挫败感，提高学习积极性。

其次，它是一本由资深英语教学专家专门为英语学习者编写的科普知识学习教材，因此课程设计、素材选择和组织都非常严谨实用。作者Tim Collins是富布赖特（Fulbright）学者，曾任教于中国、摩洛哥、西班牙和美国，在教授英语学习者方面积累了丰富的经验，对英语学习者的需求有着切身的体会。这些经验和体会在本书的编写中得到了积极运用。从第xx~1页上关于内容架构的介绍中可以看出，《科学英语入门》（中文注释版）信息量适中，不一味贪多，而且非常注重信息的内容质量和信息传递方式的多样化，综合运用了图解词典、语文词典、阅读教材和听力教材的元素。由于本书旨在让读者掌握科学概念和技能，因此行文注意控制语言难度，编排时也遵循从词汇到概念再到技能的清晰思路，由浅入深。所以，全书让人感觉信息丰富有趣而不繁琐，学习目标简单明确可行，切合中学生的认知规律。

第三，科普读物一般按主题选编文章，但各主题之间的联系不大。而我们只要看一下《科学英语入门》（中文注释版）各大主题下的小主题，就很容易发现这些主题是环环相扣、层层深入的，似乎跳过任何一个

都会对思维带来些许纷扰，这一点在“生命科学”中表现尤为明显。这就保证了关键词汇在相关主题中有一定的复现率，从而能让读者在新主题下巩固已学的科学词汇和概念。

第四，本书的检索系统非常完备，不仅相关主题之间设置了参见，而且正文后还提供了以下材料，供读者多途径检索目标：

1. 中英对照词汇表 (Glossary with Chinese Translations)：列出了每个小主题词汇表中的词汇和短文中的黑体词，并提供国际音标、汉语对应词和所在页码。
2. 索引 (Index)：列出了本书出现的所有术语及所在页码。
3. 技能索引 (Skills Index)：列出了书中介绍的技能及所在页码。

第五，除了调动视觉因素来学习，如配图表等，《科学英语入门》(中文注释版)还为每个主题的词汇表和短文配了真人录音，既提高听力，又是书本内容在头脑中的再一次刻画。

因为有开放式问题的存在，《科学英语入门》(中文注释版)留有巨大的空间供教师组织教学；因为遵循庇护式教学理念并配有录音，它又可以作为自学的上好材料。学习《科学英语入门》(中文注释版)，您收获的将不仅是科学知识或英语，而是两者。

Gateway to Science Scope and Sequence Chart

Science Basics						Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
						Thinking Like a Scientist	experimental design, observation, question, hypothesis, prediction, experiment, data, analyze, conclusion, descriptive design, correlational design nectar, relationships	The scientist saw/noticed/ observed the foods birds eat.	Word Parts: analyze Word Families: conclusion, conclude	Observing and Describing Finding Relationships Experimenting	Analyzing Information Hypothesizing	Looking at Relationships	Systems, order, and organization; Evidence, models, and explanation; Abilities necessary to do scientific inquiry; Understandings about scientific inquiry; Science and technology in society; Science as a human endeavor; Nature of science.
						Science Tools	graduated cylinder, beaker, balance, test tube, petri dish, computer, anemometer, thermometer, microscope, telescope volume, meniscus, glass slide, stage, objective lens, eyepiece lens, coarse adjustment, medium power lens, high power lens, fine adjustment, satellites, GOES, geostationary	The lenses of a microscope enlarge/ magnify an object.	Word Parts: meter Word Origins: microscope, telescope	Finding Volume by Displacement A Compound Microscope GOES Weather Satellite	Making Inferences Applying Information	Reading Volume on a Graduated Cylinder	Change, constancy, and measurement; Abilities necessary to do scientific inquiry; Nature of science.
						Metric Units of Measurement	milliliter (mL), liter (L), meter (m), centimeter (cm), millimeter (mm), kilometer (km), cubic centimeter (cm ³), kilogram (kg), gram (g), degree Celsius (C) metric system, mass, length, volume, thermometer, temperature	The number 0.4 is four tenths . The number 200 is two hundred . The number .02 is two hundredths . The number 3,000 is three thousand . The number 0.003 is three thousandths .	Prefixes: kilo, deci, centi, milli Word Origins: thermometer	The Metric System Temperature Scales	Classifying Information Analyzing Information	Comparing and Contrasting	Systems, order, and organization; Change, constancy, and measurement; Abilities necessary to do scientific inquiry; Understandings about scientific inquiry; Nature of science; History of science.
						Data Analysis	line graph, pie chart, bar graph, data table, flow chart, Venn diagram, map, map key organize, compare, title, rows, columns, earthworms, volume, percentages	A line graph shows relationships between numbers. A pie chart is used to compare the parts with the whole.	Multiple-Meaning Words: table	Understanding Tables Understanding Graphs Understanding Pie Charts	Comparing and Contrasting Applying Information	Organizing Data	Evidence, models, and explanation; Change, constancy, and measurement; Abilities necessary to do scientific inquiry; Nature of science.
						Safety in the Lab	goggles, lab apron, gloves, soap and water, fire extinguisher, fire alarm, first aid kit	You can avoid/prevent problems by following safety rules.	Syllabification: extinguisher Word Origins: experiment	Staying Safe Responding to Accidents Treatment of Living Things	Looking for Patterns Making Observations	Reading Safety Signs and Warnings	Abilities necessary to do scientific inquiry; Understandings about scientific inquiry.

Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
The Cell	cell, cytoplasm, cell membrane, chloroplast, vacuole, nucleus, endoplasmic reticulum, ribosome, Golgi complex, lysosome, mitochondria, cell wall organelles, microscope, bacteria	The cell membrane controls/ is in charge of motion in or out of the cell.	Multiple-Meaning Words: cell Word Origins: chloroplast	What Do Organelles Do? Robert Hooke Sees Cells Bacteria Cells	Making Inferences Integrating Information	Reading a Table	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Diversity and adaptation of organisms.
Single-Celled Organisms	pseudopod, amoeba, paramecium, cilia, protozoans, trichonympha, algae, dinoflagellate, flagella, fungus, yeast, bacteria chloroplasts, euglena, energy, trypanosome, sunlight, crust, tube worms	Protozoans get/ obtain/ acquire food by eating other cells.	Word Origins: pseudopod Irregular Plurals: bacteria	Kinds of Single-Celled Organisms Getting Energy Extreme Conditions for Life	Making Inferences Comparing and Contrasting	Comparing and Contrasting	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Populations and ecosystems; Diversity and adaptation of organisms.
Multicellular Organisms	cell, tissue, organ, organ system red blood cells, gases, white blood cells, cell division, chromosomes	Tissues contain many like cells. Organs are made up of different kinds of cells.	Word Parts: multicellular Phrasal Verbs: move away from	Kinds of Animal Cells How Cells Divide	Comparing and Contrasting Applying Information	Looking for Details	Systems, order, and organization; Form and function; Structure and function in living systems; Personal health.
Plants	flower, sunlight, stem, leaf, soil, root, cone, fruit, seed, spores rock, humus, nutrients, minerals, clay, sandy, loam, nitrogen, chemicals, digest	Rocks in soil provide/ supply plants with minerals.	Irregular Plurals: leaves Noncount Nouns: air, water, sunlight	Plant Parts What Is Soil? The Venus Flytrap	Analyzing Evidence Comparing and Contrasting	Reading Bar Graphs	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Populations and ecosystems; Diversity and adaptation of organisms; Populations, resources, and environments.
Kinds of Plants	vascular plants, ferns, flowering plants, conifers, cones, xylem, phloem, seeds, nonvascular plants, mosses, liverwort, leaves, stem, roots stamens, pistils, anther, pollen, pollination, ovule, fertilizes, spores, germinate, seedling	Ferns share traits/ features/ characteristics with both mosses and seed plants.	Word Parts: conifer Suffixes: -less	Flowering Plants What Is a Fern? How a Seed Works	Making Inferences Comparing and Contrasting	Reading Steps in a Sequence	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Diversity and adaptation of organisms.
Photosynthesis	sunlight, green plant, roots, leaves, chlorophyll, chloroplast, stems, photosynthesis, soil, guard cells, stomata, xylem, phloem carbon dioxide, glucose, oxygen, annual rings	Plants produce oxygen in photosynthesis. They release the oxygen as a waste product.	Word Origins: photosynthesis Multiple-Meaning Words: tissue	Photosynthesis Transport in a Plant Annual Tree Rings	Making Inferences Applying Information	Interpreting a Diagram	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems.

Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
Animals	backbone, air, water, octopus, shark, turtle, crab, duck, frog, grosbeak, nest, raccoon, shelter, deer, food worms, sponges, jellyfish, insects, birds, fish, reptiles, mammals, cells, senses, reproduce, brain, suckers, shellfish, funnel	An octopus needs/ requires food, air, water, and shelter.	Word Origins: animal Word Origins: octopus	Kinds of Animals What Is an Animal? The Amazing Octopus	Comparing and Contrasting Making Inferences	Reading a Pie Chart	Systems, order, and organization; Form and function; Structure and function in living systems; Diversity and adaptation of organisms; Populations, resources, and environments.
Invertebrates	backbone, invertebrates, basket sponge, jellyfish, tapeworm, heartworm, earthworm, beetle, centipede, spider, clam, shell, scallop, lobster, sea star arachnids, molting, metamorphosis, insects, caterpillar, chrysalis, pores	Caterpillars develop into/ become/ change into butterflies.	Multiple-Meaning Words: sponge Multiple-Meaning Words: stage	Arachnids Metamorphosis How Sponges Work	Integrating Information Making Observations	Reading a Cycle Diagram	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Diversity and adaptation of organisms; Populations, resources, and environments.
Vertebrates	backbone, vertebrates, fish, trout, seahorse, amphibians, frog, salamander, reptiles, crocodile, snake, birds, flamingo, penguin, mammals, bear, human warm-blooded, cold-blooded	Seahorses belong to/ are part of/ are members of the fish group of vertebrates.	Word Origins: amphibian Compound Words: warm-blooded, newborn	Warm-blooded and Cold-blooded Vertebrates Kangaroos Are Pouches	Classifying Information Analyzing Information	Comparing and Contrasting	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Diversity and adaptation of organisms.
The Human Body	bones, muscles, blood vessels, heart, kidney, liver, stomach, intestines, brain, lungs, skin organ systems, energy	The excretory system controls/ is responsible for/ is in charge of removing wastes.	Word Meanings: heart Word Families: circular, circulate, circulation	Organ Systems The Circulatory System	Making Inferences Comparing and Contrasting	Concept Maps	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Personal health.
Asexual Reproduction	asexual reproduction, cell division/ mitosis, parent cell, nucleus, daughter cells, chromosome, leaf, stem, root, vegetative reproduction, bulb bacteria, amoebas, yeast, prophase, metaphase, anaphase, telophase, runners	Cellular reproduction occurs in a series/ sequence of stages.	Word Parts: reproduction Word Parts: prophase, metaphase, anaphase, telophase	Bacteria Reproduction Mitosis Vegetative Reproduction	Inferring from Evidence Analyzing Information	Looking for Patterns	Form and function; Evidence, models, and explanation; Structure and function in living things; Reproduction and heredity; Personal health.

Life Science					Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
					Sexual Reproduction	sexual reproduction, parent cell, chromosome, meiosis, cell division, daughter cells, sex cells process, crossing over, sperm, variations	First , matching chromosomes come close to one another. Then , crossing over can occur. Finally , two daughter cells form.	Prefixes: a- Two-Word Verbs: line up	Meiosis and Sex Cells Variations	Making Inferences	Reading a Flowchart	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure and function in living systems; Reproduction and heredity; Personal health.
					Genetics	chromosome, gene, thymine, cytosine, adenine, guanine, trait, DNA, double helix offspring, inherit, dominant, recessive, Punnett square	A dominant gene controls/ is responsible for tongue rolling.	Multiple-Meaning Words: base Antonyms: dominant, recessive	Dominant and Recessive Traits Punnett Squares	Inferring from Evidence Applying Information	Reading a Punnett Square	Systems, order, and organization; Evidence, models, and explanation; Evolution and equilibrium; Reproduction and heredity; Diversity and adaptations of organisms.
					Changes Over Time	organism, adaptation, beak, species, common ancestor, subspecies, variation, fossil evolution, base, extinct, natural selection	Variations happen/ develop/ occur over time.	Suffixes: -tion Multiple-Meaning Words: theory	The Theory of Evolution Natural Selection	Interpreting Information Recognizing Evidence	Reading a Tree Diagram	Systems, order, and organization; Evidence, models, and explanation; Evolution and equilibrium; Form and function; Understandings about scientific inquiry; Structure and function in living systems; Reproduction and heredity; Diversity and adaptations of organisms; Populations, resources, and environments; Nature of science.
					Classification Systems	six kingdoms, eubacteria kingdom, bacteria, cyanobacteria, archaeobacteria kingdom, halophiles, methanogens, protist kingdom, seaweed, protozoan, fungi kingdom, mushrooms, mold, plant kingdom, fern, pine tree, animal kingdom, worm, dog phylum, class, order, family, genus, species, DNA, binomial nomenclature	A pine tree belongs to/ is a member of/ is part of the plant kingdom.	Multiple-Meaning Words: mushroom Synonyms: alike, like, similar	Levels of Classification Using DNA to Classify Two-part Names	Comparing and Contrasting Interpreting Information	Reading a Diagram	Systems, order, and organization; Heredity; Diversity of organisms.

Life Science					Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
					Biomes and Ecosystems	ecosystems, biomes, tundra, taiga, deciduous forest, rain forest, grassland, desert, community, population, species ecological succession, temperature, rainfall, adapted, climate, habitat, kangaroo rats	Lizards and cactus plants are equipped/ adapted to live in deserts.	Word Origins: deciduous Word Origins: ecosystem	Ecological Succession Desert Biomes The Kangaroo Rat's Ecosystem	Applying Information Analyzing Evidence	Reading a Timeline	Systems, order, and organization; Evidence, models, and explanation; Evolution and equilibrium; Population and ecosystems; Diversity and adaptations of organisms; Populations, resources, and environments.
					Energy Transfer in Living Things	consumer, producer, food chain, carnivore, food, herbivore, decomposer, food web energy pyramid, heat, symbiosis, mutualism, commensalism, parasitism, host, intestines, predator, prey, hunt	Not all energy moves to/ transfers to the next level in a pyramid.	Word Origins: carnivore, herbivore Word Families: -sis and -fic	An Energy Pyramid Symbiosis Predators and Their Prey	Analyzing Evidence Applying Information	Interpreting an Illustration	Systems, order, and organization; Evidence, models, and explanation; Population and ecosystems; Populations, resources, and environments.
					Cycles in Nature	evaporation, condensation, precipitation, runoff, groundwater, cycle, water, cloud, rain, snow nitrogen, bacteria, transpiration	Living things give off/ release/ discharge gases during the oxygen-carbon dioxide cycle.	Suffixes: -ation Nouns Used as Verbs: cycle	The Nitrogen Cycle The Oxygen/Carbon Dioxide Cycle Plants in the Water Cycle	Making Inferences Thinking About Systems	Reading a Model	Systems, order, and organization; Evidence, models, and explanation; Form and function; Structure of the earth system; Populations, resources, and environments.
					Responding to the Environment	migration, stimulus, response, estivation, hibernation, phototropism gravitropism, behavior, reflex, learned behavior, instincts	Plants respond/ react to a source light.	Irregular Plurals: stimuli Word Parts: phototropism	Plant Responses Watching Plants Move Behavior by Instinct	Making Observations Interpreting Information	Interpreting Time-Lapse Photos	Systems, order, and organization; Regulations and behavior; Populations and ecosystems; Diversity and adaptation of organisms; Populations, resources, and environments.
					Conservation	extinct species, dodo, dinosaur, seed fern, mammoth, quagga, endangered species, humpback whale, black rhino, whooping crane, mountain gorilla, giant panda, Siberian tiger, hedgehog cactus species, subspecies, habitat, medicines, rain forests, pollution	Pollution caused weak eggshells. Weak shells resulted in broken eggs.	Prefixes: en- Irregular Plurals: species	Tigers in Danger Saving Rain Forest Plants Bald Eagles Recover	Recognizing Cause and Effect Making Inferences	Reading a Map	Systems, order, and organization; Populations and ecosystems; Populations, resources, and environments.

Earth Science						Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
						Space	space, star, galaxy, solar system, planets, telescope, radio telescope astronomical units (AU), light-years, spiral galaxy, radio waves	The arms contain/ consist of stars, gases, and dust.	Multiple-Meaning Words: space Word Parts: telescope	Distances in Space The Milky Way Galaxy Telescopes	Comparing and Contrasting Applying Information	Reading Numbers in a Table	Systems, order, and organization; Evidence, models, and explanation; Earth in the solar system.
						Stars	nebula, star, main sequence star, red giant, supergiant, white dwarf, supernova, neutron star, black hole, constellations, sun magnitude, temperature	The H-R diagram groups/ classifies/ arranges stars by magnitude and temperature.	Antonyms: dwarf, giant Word Parts: magnitude	Star Magnitude The Hertzsprung-Russell Diagram Pictures in the Sky: Constellations	Comparing and Contrasting Applying Information	Reading a Diagram	Systems, order, and organization; Evidence, models, and explanation; Form and function; Earth in the solar system.
						Our Solar System	dwarf planet, orbit, moon, comet, sun, asteroid, meteoroid, Neptune, Uranus, Saturn, Jupiter, Mars, Earth, Venus, Mercury Great Red Spot, moons, Halley's comet	The moons move around/ revolve around Jupiter.	Word Origins: orbit Synonyms: detect, discover	Jupiter and Its Moons A Famous Comet Dwarf Planets	Comparing and Contrasting Making a Prediction	Interpreting an Illustration	Systems, order, and organization; Evidence, models, and explanation; Earth in the solar system.
						Earth, the Moon, and the Sun	sun, seasons, day, night, revolve, tilt, Earth, rotation, spin, rotate, axis, moon, orbit phases	The sun seems/ appears to move across the sky during the day.	Word Families: rotate, rotation Synonyms: revolve, orbit	Length of Day and Night Summer and Winter Seasons Phases of the Moon	Applying Information Making Inferences	Making Observations	Systems, order, and organization; Evidence, models, and explanation; Earth in the solar system.
						Eclipses and Tides	tides, eclipse, high tide, low tide, solar eclipse, partial eclipse, lunar eclipse, shadow, total eclipse tidal range, gravity, spring tide, neap tide	Earth's shadow causes/ results in a lunar eclipse.	Word Families: eclipse Word Origins: solar, lunar	High and Low Tides Total and Partial Eclipses How the Sun Affects Tides	Comparing and Contrasting Recognizing Cause and Effect	Contrasting Photos	Systems, order, and organization; Evidence, models, and explanation; Earth in the solar system.
						Space Exploration	space probe, satellite, space station, space shuttle, external fuel tank, booster rocket, spacecraft, launchpad, astronaut, space suit lunar module, command module	The space shuttle carried/ transported scientists into space.	Compound Words: space shuttle, space station, space suit, space probe Word Origins: astronaut	Early Space Exploration Walking on the Moon International Space Station	Comparing and Contrasting Integrating Information	Reading a Time Line	Systems, order, and organization; Evidence, models, and explanation; Earth in the solar system; Understandings about science and technology.

Earth Science					Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
					Minerals and Rocks	minerals, feldspar, crystals, quartz, diamond, press together, rocks, igneous rocks, granite, basalt, sedimentary rocks, limestone, sandstone, layers, fossil, metamorphic rocks, marble, slate volcanoes, weathering, sediment, erosion	Heat and pressure can change/transform rock.	Multiple-Meaning Words: rock Related words: hard/harden, press/pressure	Classifying Rocks The Rock Cycle	Making Observations Hypothesizing	Interpreting a Rock Cycle Diagram	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system; Earth's history.
					Earth's Structure	plates, plate boundaries, continent, fossil, crust, upper mantle, lower mantle, outer core, inner core Pangaea, continental drift, seafloor spreading, magma, oceanic ridge, plate tectonics, plate boundary	The mantle is the layer of Earth just under/ below/ beneath the crust.	Multiple-Meaning Words: plate Word Origins: tectonics	Continental Drift Seafloor Spreading Plate Tectonics	Comparing and Contrasting Applying Information	Reading a Map	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system; Earth's history; Natural hazards.
					Earth's Surface	plain, mesa, canyon, mountain, lake, oceans, delta, rivers, continents salt water, fresh water, groundwater, atmosphere, glaciers, landforms, hills	Soil and gravel accumulate/ build up to form a delta.	Superlative Adjectives: the highest, the most famous Word History: delta	Water on Earth Earth's Landforms Fresh Water Meets Salt Water	Interpreting Information Hypothesizing	Reading a Topographic Map	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system.
					Earthquakes and Volcanoes	plates, earthquakes, seismic waves, epicenter, focus, fault, tsunami, volcano, lava, eruption, magma, vent, crater plate boundaries, diverge, converge, waves, tsunami	Earthquakes form where plates diverge (pull apart). converge (come together).	Multiple-Meaning Words: fault Word Origins: tsunami	Where Do Earthquakes Happen? Surface Waves and Tsunamis Where Do Volcanoes Form?	Making Inferences Making Observations	Interpreting a Drawing	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system; Earth's history; Natural hazards.
					Our Changing Earth	erosion, soil, glacier, sand, weathering, abrasion, ice wedging, deposition, sand dune, moraine, delta mechanical weathering, chemical weathering, react	Weathering happens/ occurs when rock is broken down.	Suffixes: <i>-tion</i> or <i>-sion</i> Multiple-Meaning Words: deposit	Weathering Glaciers Erosion and Deposition	Analyzing Evidence Looking for Patterns	Recognizing Cause and Effect	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system; Earth's history.
					The Atmosphere	cloud, air, atmosphere, fog, pollution, water vapor, gas, particles, rain, wind oxygen, nitrogen, trace gases, carbon dioxide, layers, troposphere, exosphere	The atmosphere is made of/ is composed of/ consists of several gases.	Multiple-Meaning Words: gas Word Origins: atmosphere	Gases in the Atmosphere The Oxygen-Carbon Dioxide Cycle Layers of the Atmosphere	Applying Information Making Inferences	Reading a Pie Chart	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system.

Lesson Title		Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
Earth Science	Weather and Climate	clouds, precipitation, rain, snow, hail, wind, fog, water vapor, air mass, cold front, warm front, weather map, temperature atmospheric pressure, isobars, dust, salt, gravity, climate, temperature, tropical, subtropical, polar	Some maps show/ display temperatures.	Multiple-Meaning Words: weather Word Origins: isobar	Weather Maps How Do Clouds and Rain Form? Weather and Climate	Looking for Patterns Interpreting Information	Reading a Weather Map	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system.
	Extreme Weather	thunderstorm, lightning, updraft, water vapor, downdraft, hail, waterspout, flood, tornado, rotation, hurricane, eye wall cloud, funnel, tropical disturbance, tropical depression, tropical storm, storm surges, watches, warnings	A watch means/ indicates that severe weather is possible.	Synonyms: hurricane, cyclone, typhoon Modal verbs: might	How Tornadoes Form Stages of a Hurricane Watches and Warnings	Comparing and Contrasting Analyzing Information	Interpreting a Model	Systems, order, and organization; Evidence, models, and explanation; Structure of the Earth system; Natural hazards.
	Natural Resources	water energy, wind energy, geothermal energy, nuclear energy, solar energy, recycle, fossil fuels, natural gas, coal, petroleum, minerals renewable resources, biomass, nonrenewable resources, reduce, reuse	People use/ consume natural resources.	Word Origins: geothermal Prefixes: re	Renewable and Nonrenewable Resources Recycle, Reduce, and Reuse Wind Farms	Analyzing Information Comparing and Contrasting	Using Percentages	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Structure of the Earth system; Populations and ecosystems; Populations, resources, and environments.
	Nature of Matter	senses, color, odor, taste, texture, chemical changes, burn, rust, states, gas, solid, liquid states, particles, volume, physical properties, chemical properties	You can recognize/ identify an object by its properties.	Multiple-Meaning Words: property Word Families: taste	States of Matter Observing Matter Physical and Chemical Properties	Analyzing Information Interpreting Information	Interpreting an Illustration	Systems, order, and organization; Properties and changes of matter.
Physical Science	Measuring Matter	balance, mass, graduated cylinder, volume, melting point, freezing point, gas, thermometer, boiling point, liquid, solid, sink, float buoyant force, force of gravity, density	At its melting point, ice changes to/ becomes water.	Multiple-Meaning Words: volume Frequently Misused Words: mass, weight	Changes of State Buoyancy Mass, Volume, and Density	Applying Information Analyzing Evidence	Using Numbers to Compare	Systems, order, and organization; Change, constancy, and measurement; Abilities necessary to do scientific inquiry; Understandings about scientific inquiry; Properties and changes of properties in matter; Nature of science; History of science.
	Atoms and Molecules	atom, electron, nucleus, proton, neutron, molecule, element, metal, gold, silver, nonmetal, oxygen, carbon nucleus, properties, liquid, gases, periodic table, symbol, atomic number	When two atoms join together/ combine they form a molecule.	Word History: names of elements Word History: symbols of elements	Structure of an Atom Molecules The Periodic Table of Elements	Visualizing Looking for Patterns	Interpreting a Diagram	Systems, order, and organization; Evidence, models, and explanation; Properties and changes of properties in matter.

Physical Science							
Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
Compounds and Mixtures	pure substances, elements, oxygen, aluminum, compounds, water, sugar, mixtures, heterogeneous mixture, granite, homogenous mixture, air carbon dioxide, sodium, chlorine, suspension, solution, dissolves, physical changes, chemical change	Elements join to make/ form/ produce compounds.	Multiple-Meaning Words: solution Prefixes: <i>hetero</i>	Common Compounds Types of Mixtures Physical and Chemical Changes	Applying Information Making Inferences	Comparing and Contrasting	Systems, order, and organization; Change, constancy, and measurement; Properties and changes of properties in matter.
		Chemical equations tell/ communicate/ express what happens during a chemical reaction.	Multiple-Meaning Words: equation Word Origins: endothermic, exothermic	Chemical Bonds Chemical Equations Conservation of Mass	Looking for Patterns Applying Information	Reading an Equation	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Properties and changes of properties in matter.
Radiation and Radioactivity	radioactive sample, radiation, radioactive symbol, alpha particles, beta particles, gamma rays, paper, aluminum, concrete, atom, nucleus uranium, decay, protons, neutrons, electron, half-life, X-rays, cancer, surgery	An atom decays when it gives off/ releases/ emits particles or energy.	Multiple-Meaning Words: particle Suffixes: <i>tion</i>	Discovery of Radioactivity Radioactive Decay Uses of Radiation	Making Inferences Applying Information	Comparing Data	Change, constancy, and measurement; Properties and changes of properties in matter; Transfer of energy; Understandings about scientific inquiry; Understandings about science and technology; Personal health; Natural hazards; Science and technology in society; History of science.
Forces	balanced, unbalanced, friction, push, pull, move, stop, gravity attraction, mass, weight, equilibrium	Friction works against/ opposes motion.	Multiple-Meaning Words: force Antonyms: push, pull; move, stop	Gravity Friction Balanced and Unbalanced Forces	Applying Information Inferring from Evidence	Using Numbers to Compare	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Equilibrium; Motions and forces.
Forces and Motion	velocity, mass, force, speed, acceleration, action force, reaction force inertia, friction, meters per second (m/s), m/s per second (m/s/s), equal, opposite	Forces can change/ affect an object's motion.	Related Meanings: velocity, speed, acceleration Prefixes: <i>re</i>	Newton's First Law Newton's Second Law Newton's Third Law	Analyzing Information Applying Information	Using Math to Solve Problems	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Equilibrium; Motions and forces.
Work, Power, and Machines	load, simple machines, lever, inclined plane, wedge, screw, pulley, wheel and axle, fulcrum work, effort force, compound machines	Machines reduce the force you use/ apply/ exert to do work.	Homonyms: plane, plain Multiple-Meaning Words: work	Force and Distance The Wedge Compound Machines	Applying Information Drawing Conclusions	Interpreting a Simple Machine Diagram	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Equilibrium; Motions and forces.

Physical Science					Lesson Title	Science Vocabulary	Academic Vocabulary	Word Study	Concepts	Critical Thinking	Science Skill	National Science Education Standards
					Waves	waves, transverse waves, crest, trough, wavelength, amplitude, water waves, longitudinal waves, sound waves, compression, rarefaction matter, medium, X-rays, radio waves, electromagnetic waves, electromagnetic spectrum	Light waves can move/ travel through empty space.	Multiple-Meaning Words: wave Multiple-Meaning Words: medium	Longitudinal and Transverse Waves Electromagnetic Spectrum Uses of Electromagnetic Waves	Making Inferences Comparing and Contrasting	Interpreting a Model	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Equilibrium; Motions and forces.
					Light	transparent, translucent, opaque, light source, stars, sun, natural light, candle, lamp, artificial light, reflect, refract, absorb, prism, colors	A prism divides/ separates light into different colors.	Multiple-Meaning Words: reflect Antonyms: reflect, absorb, natural, artificial	Reflection and Refraction Seeing Colors Transparent, Translucent, or Opaque	Making Observations Classifying Information	Interpreting Photos	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Transfer of energy.
					Forms of Energy	renewable energy, nonrenewable energy, sound energy, thermal energy, light energy, chemical energy, electrical energy, mechanical energy, potential energy, kinetic energy replace, hydropower, fossil fuels, vibrate, molecules	You can classify/ group energy and energy sources different ways.	Word Families: heat Prefixes: re-	Potential and Kinetic Energy Renewable and Nonrenewable Energy Sound Energy	Making Inferences Applying Information	Visualizing	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Transfer of energy.
					Energy Transformations	thermal energy, sound energy, electrical energy, chemical energy, heat, potential energy, kinetic energy, light energy, temperature conduction, convection, radiation, law of conservation of energy	A toaster changes/ converts/ transforms electrical energy into thermal energy.	Suffixes: -ation Word Origins: transfer	Heat and Temperature Heating Matter Conservation of Energy	Applying Information Inferring from Evidence	Thinking about Systems	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Equilibrium; Motions and forces.
					Energy and Life	leaf, sun, light energy, chemical energy, photosynthesis, cellular respiration, chloroplast, chlorophyll glucose, mitochondria	The sun provides/ supplies energy that living things need.	Syllabification: photosynthesis, respiration Word Origins: chlorophyll	Living Things Use the Sun's Energy Photosynthesis Cellular Respiration	Making Inferences	Making Observations	Systems, order, and organization; Transfer of energy; Structure and function in living systems; Regulation and behavior.
					Electricity and Magnetism	static electricity, charge, electron, conductor, insulator, electromagnet, magnetic poles, magnet, magnetic field, electric generator, electric current, circuit current electricity, energy source, battery, flashlight, wire, lightbulb, switch, copper wire, insulator	The metal wire is covered by/ enclosed in plastic.	Multiple-Meaning Words: positive, negative Multiple-Meaning Words: conductor	Static and Current Electricity Circuits Conductors and Insulators	Understanding Cause and Effect Integrating Information	Reading a Circuit Diagram	Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement; Transfer of energy; Abilities of technological design; Understandings about science and technology.

Scientifically Based Research in *Gateway to Science*

The National Center for Educational Statistics (NCES) states that between 1979 and 2004 the number of students aged 5 to 7 who are English Language Learners (ELLs) grew from 3.8 million to 9.9 million, or from 9% to 19% of all school aged children (2006a). Over the same 25 year period the school aged population (ages 5 to 17) increased 18%; however, the ELL student population grew 162%. The number of school-age children who spoke English with difficulty also increased from 1.3 million to 2.8 million (or 5 percent) over the same time period. In the 2003–2004 school year, English language services were provided to 3.8 million students representing 11% of all students (NCES 2006b). At the same time, state and federal legislation require schools to ensure that all students meet grade-level content standards and to place ELLs in mainstream classes on very short timelines. The content, instructional design, and accompanying ancillary materials for *Gateway to Science* are designed to help schools and teachers reach this growing population.

Standards-Based Content

In order to ensure learners achieve grade-level science standards and to prepare them for mainstream classes and textbooks, *Gateway to Science* is based upon the National Science Education Standards and is compatible with science standards for ELLs issued by TESOL and by the WIDA Consortium.

Research-Based Instructional Design

The instructional design of *Gateway to Science* is based upon the most recent scientifically based research, as well as time-tested strategies and methods for teaching and learning content and language. These are outlined below.

Content-Matter Learning

Schleppegrell (2004) identifies the challenges ELLs experience when facing science content. Volumes such as Echevarria, Vogt, & Short (2004), Reiss (2005), and Ullh Chamot & O'Malley (1994) summarize copious scientifically based research that supports the scaffolding and language development approach used in *Gateway to Science*. *Gateway to Science*, therefore, is fully compatible with approaches such as SIOP (Sheltered Instruction Observation Protocol) and CALLA (Cognitive Academic Language Learning Approach). Studies such as Fathman & Crowther (2006) and Carr, Sexton & Lagunoff (2006) present extensive scientifically based research specifically related to science for ELLs. These studies demonstrate that for students to be able to read and comprehend content science, they need activation of prior knowledge (see the Focus Question at the beginning of each lesson and the Teacher Edition); development of content vocabulary (see the first two pages of each lesson) and academic vocabulary (see the Academic Vocabulary section in each lesson); development of graphic literacy (see the numerous charts, tables and graphs in the Science Skills section in each lesson), hands-on active learning techniques (see the lab in each Workbook lesson and the activities

in the Teacher Edition); and a variety of means to build and check comprehension (see the Check Your Understanding sections in each lesson) found in *Gateway to Science*.

Vocabulary Development

Numerous studies detail the importance of vocabulary in reading and success in school, and provide research-based evidence in support of the use of the visual approach employed in *Gateway to Science* to develop learners' vocabulary. Carlo, et al. (2004) and Blachowicz & Fischer (2000) make clear cases for the relationship between vocabulary development and reading success. Kinsella (2004) strongly recommends the practice of developing key vocabulary prior to reading, and calls this process "frontloading" or "preloading" vocabulary. Blachowicz & Fischer (2000), Decarrico (2001) and Stockdale (2004) all provide evidence in support of the approach in *Gateway to Science* of presenting both labeled pictures as well as illustrations of concepts accompanied by prose explanation of them, so that students can learn both the meaning of the new terms and how they are used in context (see the vocabulary list, illustrations, and Vocabulary in Context sections in the first two pages of each lesson).

Carlo, et al. (2004) provides empirical evidence that ELLs reading comprehension benefits from systematic instruction in the vocabulary and vocabulary-related skills (deriving meaning from context, using word parts) presented in *Gateway to Science* (see the Word Study sections in each lesson). Volumes such as Marzano & Pickering (2005) and studies such as Coxhead (2000) stress the importance of developing students' academic vocabulary and provide criteria on selecting appropriate lexical items (see the Academic Vocabulary section in each lesson).

Nation (2001) and Nation (2005) give support for the variety of vocabulary development activities included in the Teacher Edition and Workbook.

Best Practices in Teaching English Language Learners

Gateway to Science is compatible with Best Practices for Teaching ELLs recommended in studies such as Echevarria, Vogt, & Short (2004), Fathman & Crowther (2006), Carr, Sexton & Lagunoff (2006), Crowther, Robinson, Edmondson (in press), Douglas, Klentschy, Watts and Binder (2006). These best practices include:

- Providing clear science and language objectives (see the Teacher Edition).
- Building on students' prior knowledge (see the Focus Question in each lesson and the Set the Stage activity in the Teacher Edition).
- Using hands-on inquiry and activities (see the Research and Inquiry questions in each lesson, the labs in each Workbook lesson).
- Introducing key vocabulary in context (see the Vocabulary in Context section in each lesson).
- Providing scaffolding for learning complex content and vocabulary (see the progression from vocabulary in the first two pages in each lesson to the concepts in the second two pages in each lesson).