



THE NEW YORK CITY DEPARTMENT OF EDUCATION

JOEL I. KLEIN, *Chancellor*

Carmen Fariña, Deputy Chancellor for Teaching & Learning

Laura Kotch, *Executive Director*

Office of Curriculum and Professional Development

Julia A. Rankin Ph.D., *Director*

Department of the Sciences

52 Chambers Street, Room 208

New York, NY 10007

☎ (212) 374-0465 ▪ Fax: (212) 374-5901/5763 ▪ ✉ jrankin2@nycboe.net

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Middle School (6-8) Scope and Sequence Science

Middle School Science Scope and Sequence Advisory Team

NAME	POSITION	REGION
Abel, Judith	RIS	1
O'Raffity, Elizabeth	AP	1
Hashim, Shehnaz	Teacher	1
Bethune, Cathy	Teacher	1
Talty, Mark	Teacher	1
Awadalleh, Nadya	RIS	2
Phelps, Dawnette	Teacher	2
Hartnett, Barbara	AP	2
Zadrozny, Christine	Teacher	2
Ackie, Auburn	Lead Teacher	2
Whitter, Sharon	Teacher	2
Damari, Marianita	RIS	3
Cambier, Michelle	RIS	4
Castro, Miriam	RIS	4
Dowd, Donna	Teacher	4
Gartu, Christina	Teacher	4
Miller, Jennifer	Teacher	4
Grambo, Gregory	Teacher	4
Mobley, Tai Asia	Teacher	4
Pillersdorf, Diane	RIS	5
Kleppel, Robert	Staff Developer	5
Edwards, Kathy	Teacher	5
Gordon, Doreen	Teacher	5
Ramnauth, Liliana	Teacher	5
Grover, Reena	Teacher	5
Mineo, Christine	RIS	6
Hirsch, Allan	Staff Developer/Teacher	6
Fico, Rita	Staff Developer/Teacher	6
Smith, Charlene	RIS	7
Scarmato, Joseph	RIS	7
Chung, Joyce	Teacher	7

NAME	POSITION	REGION
Mosachio, Joseph	Teacher	7
Crane, Susan	Teacher	7
Hernandez, Ed	AP	7
Green, Charlese	Teacher	7
Renz, Amy	AP	7
Davis, <u>Derresa</u>	RIS	8
Chester, <u>Jean</u>	Teacher	8
Slinger, <u>Hazel</u>	Teacher	8
Olowoyo, <u>Omatayo</u>	Teacher	8
Azcone, Isabelito	Teacher	8
Gioe-Cordi, Lisa	Principal	8
Lesmes, Marta	Teacher	8
Roberts, Megan	RIS	9
Ponze, Kathleen	Principal	9
Hahn, Traceylnn	Teacher	9
Lukens, Whitney	Staff Developer	9
Staffaroni, Kristen	Staff Developer	9
Nelson, Lisa	Principal Intern	9
Young, Sheldon	RIS	10
Cole, James	AP	10
Ford , Sabrina	Teacher	10
Oyefusi, O.A.	Teacher	10
Garcia, Bonifacio	Teacher	10
Tapia, Zenaida	Teacher	10
Henderson, Jenelle	Teacher	10
Coppola, Celeste	Teacher	10
<u>District 75</u>		
Ramdass, <u>Derek</u>	<u>Science Coordinator</u>	75
Convertino, <u>Giannina</u>	<u>Science/Literacy Coach</u>	75
Callendar, <u>Lionel</u>	Teacher	75
Julia Rankin	Director of Science	Central
Greg Borman	Science Specialist	Central
Roy Harris	Science Specialist	Central

NAME	POSITION	REGION
Advisors	Affiliation	
Calabrisi-Barton, Angela	Teacher's College	
Degnan, Nancy	Columbia	
Raia, Federica	City College	
Mayer, Marc	School at Columbia	
Cook, Don	Bank St College	
Miksic, Mark	Queens College	

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New York City Department of Education

Middle School (6-8) Scope and Sequence for Science

Grade 6: Transformation of Energy; Systems			
Unit 1	Unit 2	Unit 3	Unit 4
<p style="text-align: center;">Simple and Complex Machines</p> <ul style="list-style-type: none"> • Potential and kinetic energy • Mechanical energy • Machines can affect the magnitude or direction of a force required to do work, or the distance over which that force is applied. • Simple machines include the lever, the pulley, the wheel and axle, and the inclined plane. • Complex machines • Transformation of energy within simple and complex machines • Principle of the conservation of energy • Friction and machines <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • metric ruler • spring scale 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 7. Sequence events 8. Identify cause-and-effect relationships 	<p style="text-align: center;">Weather</p> <p>Properties of Matter</p> <ul style="list-style-type: none"> • Matter is anything that takes up space and has mass. • Solids, liquids, and gases • Relationship between phases of matter and particle motion • Density <p>Heating and cooling events</p> <ul style="list-style-type: none"> • Principle of the conservation of energy • Transfer of heat: radiation, convection, and conduction • Heat and its relationship to phase changes • Expansion and contraction <p>Weather</p> <ul style="list-style-type: none"> • Weather is the result of complex interactions of the atmosphere, hydrosphere, and lithosphere; all weather is caused by the unequal heating of the earth’s surface. • Light energy vs. heat energy • Hydrosphere/atmosphere interactions: Water cycle, Precipitation • Weather factors: Pressure, relative humidity, temperature, wind • Air masses and fronts • Extreme weather events: hurricanes, tornadoes, blizzards, drought <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • metric ruler 	<p style="text-align: center;">Biodiversity</p> <p>Kingdoms of Life</p> <ul style="list-style-type: none"> ▪ What makes something “alive”? • The cell is a basic unit of structure and function of living things • Unicellular vs. multicellular organisms • Biological classification systems <p>Food Chains and Food Webs</p> <ul style="list-style-type: none"> • Principle of the conservation of energy • Flow of energy and matter through food chains and food webs • Methods for obtaining nutrients • Role of producers • Role(s) of consumers: idea of respiration/recycling; herbivores/carnivores/omnivores • The role of decomposers <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 4. Recognize and analyze patterns and trends 6. Develop and use a dichotomous key 7. Sequence events 8. Identify cause-and-effect relationships <p>Living Environment Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Manipulate a compound microscope to view microscopic objects 2. Determine the size of a microscopic object using a compound microscope 6. Classify living things according to a student-generated scheme and an established scheme 7. Interpret and/or illustrate the energy flow in a food chain, energy pyramid, or food web 	<p style="text-align: center;">Interdependence</p> <p>Climate and Biomes</p> <ul style="list-style-type: none"> • Climatic regions • Biomes: Tundra, Tropical Rain Forest, Temperate Forests, Grasslands, Desert • Seasonal variations • Effect of elevation • Global Warming: natural cycles vs. human impact <p>Ecosystems and Interdependence</p> <ul style="list-style-type: none"> • Populations and definition of species • Communities • Ecosystems (including basic abiotic factors such as water, nitrogen, CO₂, and oxygen) • Factors affecting the population growth of organisms -- Predator /prey relationships • Relationships among organisms: beneficial and harmful • Effects of environmental changes on humans and other populations <p>Adaptations for survival</p> <ul style="list-style-type: none"> • Thermoregulation in plants and animals • Locomotion <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • thermometer 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 8. Identify cause-and-effect relationships 9. Use indicators and interpret results

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Middle School (6-8) Scope and Sequence for Science

Grade 6: Transformation of Energy; Systems			
Unit 1	Unit 2	Unit 3	Unit 4
	<ul style="list-style-type: none"> • balance • graduated cylinder • thermometer <ol style="list-style-type: none"> 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 5. Classify objects according to an established scheme and a student-generated scheme 7. Sequence events 8. Identify cause-and-effect relationships <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Given the latitude and longitude of a location, indicate its position on a map and determine the latitude and longitude of a given location on a map 7. Generate and interpret field maps including topographic and weather maps 8. Predict the characteristics of an air mass based on the origin of the air mass 9. Measure weather variables such as wind speed and direction, relative humidity, barometric pressure, etc 10. Determine the density of liquids, and regular- and irregular-shaped solids 	<ol style="list-style-type: none"> 9. identify structure and function relationships in organisms 	<p>Living Environment Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 6. Classify living things according to a student-generated scheme and an established scheme 9. Identify structure and function relationships in organisms <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Given the latitude and longitude of a location, indicate its position on a map and determine the latitude and longitude of a given location on a map 5. Use a magnetic compass to find cardinal directions 6. Measure the angular elevation of an object, using appropriate instruments 7. Generate and interpret field maps including topographic and weather maps

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Middle School (6-8) Scope and Sequence for Science

Grade 7: Cycles of Matter and Energy; Form and Function; Classification			
Unit 1	Unit 2	Unit 3	Unit 4
<p style="text-align: center;">Geology</p> <p>Earth as a System</p> <ul style="list-style-type: none"> Layers and composition: Lithosphere, Hydrosphere, Atmosphere, Biosphere <p>Rocks and Minerals</p> <ul style="list-style-type: none"> Rock cycle Classification of rocks: Sedimentary, metamorphic, and igneous rocks Properties of minerals including density Erosion and weathering <p>Fossils and Earth's History</p> <ul style="list-style-type: none"> Where fossils are found Dating of rocks: Absolute and relative age The importance of the fossil record <p>Plate Tectonics</p> <ul style="list-style-type: none"> Theory of plate movement and evidence supporting the theory Convection currents Buoyancy (relative density) Sea-floor spreading Earthquakes: faulting and folding of the earth's crust Volcanoes Mountain building Topography of Earth's surface <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> Follow safety procedures in the classroom and laboratory Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> metric ruler 	<p style="text-align: center;">Interactions Between Matter and Energy</p> <p>Properties of Sound and Light</p> <ul style="list-style-type: none"> Electromagnetic energy Wave behavior <ul style="list-style-type: none"> Light- reflection and refraction Vibrations and sound waves <p>Properties of matter</p> <ul style="list-style-type: none"> The properties of materials, such as: density, conductivity, magnetic materials, and solubility Elements and compounds Atoms and molecules The Periodic Table as a way of organizing the elements <p>Physical and Chemical changes</p> <ul style="list-style-type: none"> Characteristics of physical changes: <ul style="list-style-type: none"> Review of phase change/states of matter Mixtures and solutions Temperature and its effect on solubility Characteristics of chemical changes <p>Understanding Chemical Reactions: Photosynthesis and Respiration</p> <ul style="list-style-type: none"> Law of Conservation of Mass Energy changes in chemical reactions Law of Conservation of Energy Interactions among atoms and/or molecules result in chemical reactions. <p><i>(PHOTOSYNTHESIS AND RESPIRATION as context for chemical change as well as transformation of energy: Light, chemical; heat)</i></p>	<p style="text-align: center;">Dynamic Equilibrium: the Human Animal</p> <p>Levels of Organization</p> <ul style="list-style-type: none"> Cells- structure and function Tissues; organs; systems; organism <p>The Human Body</p> <ul style="list-style-type: none"> Maintaining homeostasis: The human body systems <ul style="list-style-type: none"> Digestive Respiratory Circulatory Excretory Skeletal and Muscular Obtaining energy Obtaining nutrients Regulation of the internal environment Metabolism Responding to the external environment (Nervous system) <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> Follow safety procedures in the classroom and laboratory Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> metric ruler stopwatch <i>(for pulse rate)</i> thermometer Use appropriate units for measured or calculated values Sequence events Identify cause-and-effect relationships 	<p style="text-align: center;">Dynamic Equilibrium: Other Organisms</p> <p>Other Animals</p> <ul style="list-style-type: none"> Animal structures and systems Maintaining homeostasis Obtaining energy Obtaining nutrients Regulation of the internal environment Metabolism Responding to the external environment <p>Plants</p> <ul style="list-style-type: none"> Plant structures and systems Maintaining homeostasis Obtaining energy Obtaining nutrients Regulation of the internal environment Metabolism Responding to the external environment <p>One-celled Organisms</p> <ul style="list-style-type: none"> Unicellular vs. multicellular organisms Maintaining homeostasis Obtaining energy Obtaining nutrients Regulation of the internal environment Metabolism Responding to the external environment <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> Follow safety procedures in the classroom and laboratory Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> metric ruler Use appropriate units for measured or calculated values

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Middle School (6-8) Scope and Sequence for Science

Grade 7: Cycles of Matter and Energy; Form and Function; Classification			
Unit 1	Unit 2	Unit 3	Unit 4
<ul style="list-style-type: none"> • balance • graduated cylinder <ol style="list-style-type: none"> 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 5. Classify objects according to an established scheme and a student-generated scheme 7. Sequence events 9. Use indicators and interpret results <p>Living Environment Skills (from NYS Core Curriculum) (if use microscopes to look at crystals)</p> <ol style="list-style-type: none"> 1. Manipulate a compound microscope to view microscopic objects 2. Determine the size of a microscopic object, using a compound microscope <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Given the latitude and longitude of a location, indicate its position on a map and determine the latitude and longitude of a given location on a map 2. Using identification tests and a flow chart, identify mineral samples 3. Use a diagram of the rock cycle to determine geological processes that led to the formation of a specific rock type 4. Plot the location of recent earthquake and volcanic activity on a map and identify patterns of distribution 5. Use a magnetic compass to find cardinal directions 6. Measure the angular elevation of an object, using appropriate instruments 7. Generate and interpret field maps including topographic and weather maps 10. Determine the density of liquids, and regular- and irregular-shaped solids 11. Determine the volume of a regular- and an irregular-shaped solid, using water displacement 13. Determine the identity of an unknown element, using physical and chemical properties 	<p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • balance • graduated cylinder • thermometer • spring scale • voltmeter 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 5. Classify objects according to an established scheme and a student-generated scheme 7. Sequence events 9. Use indicators and interpret results <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 10. Determine the density of liquids, and regular- and irregular-shaped solids 12. Using the periodic table, identify an element as a metal, nonmetal, or noble gas 13. Determine the identity of an unknown element, using physical and chemical properties 14. Using appropriate resources, separate the parts of a mixture 15. Determine the electrical conductivity of a material, using a simple circuit 	<p>Living Environment Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Manipulate a compound microscope to view microscopic objects (<i>look at different types of cells and tissues</i>) 2. Determine the size of a microscopic object using a compound microscope 7. Interpret and/or illustrate the energy flow in a food chain, energy pyramid, or food web (<i>with regard to nutrients and calories</i>) 8. Identify pulse points and pulse rates 9. Identify structure and function relationships in organisms 	<ol style="list-style-type: none"> 4. Recognize and analyze patterns and trends 5. Classify objects according to an established scheme and a student-generated scheme 6. Develop and use a dichotomous key 7. Sequence events 8. Identify cause-and-effect relationships <p>Living Environment Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Manipulate a compound microscope to view microscopic objects 2. Determine the size of a microscopic object using a compound microscope 3. Prepare a wet mount slide 4. Use appropriate staining techniques 6. Classify living things according to a student-generated scheme and an established scheme 9. Identify structure and function relationships in organisms

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Middle School (6-8) Scope and Sequence for Science

Grade 8: Constancy and Change			
Unit 1	Unit 2	Unit 3	Unit 4
<p style="text-align: center;">Reproduction, Heredity, and Evolution</p> <p>Reproductive Patterns and the Continuity of Life</p> <ul style="list-style-type: none"> • Asexual Reproduction e.g. Binary fission in unicellular organisms, plant budding, • Sexual Reproduction – formation of gametes • Compare and contrast results, contexts, advantages and disadvantages of each method <p>Patterns of Development and the Continuity of Life</p> <ul style="list-style-type: none"> • Patterns of development in plants • Patterns of development in animals • Cell division-growth, maintenance, and repair - Cancer is the result of abnormal cell division <p>Heredity</p> <ul style="list-style-type: none"> • Genes and DNA • Mendelian genetics • Mutations <p>Role of Sexual and Asexual Reproduction in Human Growth and Development</p> <ul style="list-style-type: none"> • The role of the sperm and egg • Human reproductive system • Hormonal regulation: Endocrine system • Patterns of development: cell division and genetic expression • Genetic diseases • Genetic engineering, esp. cloning 	<p>Humans in their Environment: Needs and Tradeoffs</p> <p>Natural Resources and Energy</p> <ul style="list-style-type: none"> • Energy needs • Renewable and non-renewable sources of energy • Material needs • Renewable and non-renewable sources of materials • Environmental concerns: Acquisition and depletion of resources; Waste disposal; Land use and urban growth; Overpopulation; Global Warming; Ozone depletion; Acid rain; Air pollution; Water pollution; Impact on other organisms • Energy conservation <p>Nutrition and Food Choices: Impact on the Environment and on our Health</p> <p>Environment:</p> <ul style="list-style-type: none"> • Environmental Toxins: pesticides and herbicides; fertilizers; organic waste • Endangered species: Habitat destruction, over fishing • Packaging and solid waste • Water issues: depletion; pollution <p>Homeostasis and Health:</p> <ul style="list-style-type: none"> • Analyzing nutritional value • Food –borne illness: Infectious disease and the immune system (bacteria, parasites) • System failures: heart disease; high blood pressure; colon cancer; epidemics of childhood obesity and diabetes; osteoporosis 	<p style="text-align: center;">Earth, Sun, Moon System</p> <p>Seasons and Cycles: Relationships among the sun, earth and moon</p> <ul style="list-style-type: none"> • Day: rotation • Year: revolution • Seasons: Tilt of Earth’s axis of rotation • Phases of the Moon • Eclipses • Tides <p>Solar System</p> <ul style="list-style-type: none"> • Classification of celestial objects: stars including the sun; planets; comets; moons; and asteroids • Patterns of motion, frame of reference and position, direction, and speed • Observe, describe, and compare the effects of balanced and unbalanced forces on the motion of objects <ul style="list-style-type: none"> - Newton’s First Law of Motion: Inertia - gravity <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • metric ruler • stopwatch • spring scale 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 5. Classify objects 	<p style="text-align: center;">Forces and Motion on Earth</p> <ul style="list-style-type: none"> • Patterns of motion, frame of reference and position, direction, and speed • Newton’s First Law of Inertia • Newton’s Second Law: $F=ma$ (<i>conceptual understanding as opposed to teaching the formula</i>) • Newton’s Third Law: For every reaction there is an equal and opposite reaction; Force as an interaction <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: <ul style="list-style-type: none"> • metric ruler • balance • stopwatch • spring scale 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 8. Identify cause-and-effect relationships <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 16. Determine the speed and acceleration of a moving object

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Middle School (6-8) Scope and Sequence for Science

Grade 8: Constancy and Change			
Unit 1	Unit 2	Unit 3	Unit 4
<p>Natural Selection: The Driving Mechanism Behind Evolution</p> <ul style="list-style-type: none"> • Sources of variation in organisms • Adaptations • Competition • Extinction • Evidence for evolution <p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 4. Recognize and analyze patterns and trends 7. Sequence events <p>Living Environment Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Manipulate a compound microscope to view microscopic objects (<i>e.g. look at cells undergoing mitosis</i>) 2. Determine the size of a microscopic object using a compound microscope 5. Design and use a Punnett square or a pedigree chart to predict the probability of certain traits 6. Classify living things (<i>evolutionary relationships</i>) 8. Identify cause-and-effect relationships 9. Identify structure and function relationships in organisms 	<p>General Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Follow safety procedures in the classroom and laboratory 2. Safely and accurately use the following measurement tools: (<i>depends on project</i>) 3. Use appropriate units for measured or calculated values 4. Recognize and analyze patterns and trends 7. Sequence events 8. Identify cause-and-effect relationships 9. Use indicators and interpret results <p><i>[Note: Physical Setting and Living Environment Skills will vary depending on projects pursued]</i></p> <p>Living Environment</p> <ol style="list-style-type: none"> 7. Interpret and/or illustrate the energy flow in a food chain, energy pyramid, or food web 9. Identify structure and function relationships in organisms (<i>within the study of system failures</i>) <p>Physical Setting: <i>Look for opportunities to address density, as this is a significant concept for the ILSE</i></p>	<p>8. Identify cause-and-effect relationships</p> <p>Physical Setting Skills (from NYS Core Curriculum)</p> <ol style="list-style-type: none"> 1. Given the latitude and longitude of a location, indicate its position on a map and determine the latitude and longitude of a given location on a map 	