

LAB-AIDS Alignment to

Science High School Course Maps for Earth and Space Sciences Courses

Regents Examination in Science¹

The New York State P-12 Science Learning Standards are based on guiding documents (*A Framework for K-12 Science Education* and the Next Generation Science Standards) grounded in the most current research in science and scientific learning. They reflect the importance of every student's engagement with natural scientific phenomena at the nexus of three dimensions of learning: Science and Engineering Practices, Disciplinary Core Ideas, and Cross-Cutting Concepts. Performance expectations are the way to integrate the three dimensions guiding student sense-making of science as discussed in the New York State P-12 Science Learning Standards Introduction.

Key Notes: Diagram 1 (p. 3) provides visual representation:

1. In order to eliminate potential redundancy, seek an appropriate grain size, and seek natural connections among the Disciplinary Core Ideas (DCIs) identified within A Framework for K-12 Science Education. New York State arranged the performance expectations into topics.

2. Student performance expectations (PEs) may be taught in any sequence or grouping within a course.

3. The highlighted performance expectations are performance expectations that are unique to New York State.

4. An asterisk (*) indicates an engineering connection to a practice, core idea, or crosscutting concept.

5. The Clarification Statements are examples and additional guidance for the instructor. (NYSED) or a highlight indicates New York specific statement/wording.

6. The Assessment Boundaries delineate content limits of concepts that may be assessed in large-scale assessments.

7. Within the standards, the section entitled "foundation boxes" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, except for statements that contain (NYSED). The material is integrated and reprinted with permission from the National Academy of Sciences.

8. Within the standards, Three Connection Boxes (not shown in the diagram), located below the Foundation Boxes, are designed to support a coherent vision of the standards by showing how the performance expectations in each standard connect to other PEs in science, as well as to Common Core State Standards.

¹ http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/ess.pdf

The three boxes include:

- Connections to other DCIs in this grade level. This box contains the names of science topics in other disciplines that have related disciplinary core ideas at the same grade level. For example, both Physical Science and Life Science performance expectations contain core ideas related to Photosynthesis and could be taught in relation to one another.
- Articulation of DCIs across grade levels. This box contains the names of other science topics that either 1) provide a foundation for student understanding of the core ideas in this set of performance expectations (usually at prior grade levels); or 2) build on the foundation provided by the core ideas in this set of PEs (usually at subsequent grade levels).
- Connections to the New York State Next Generation Learning Standards. This box contains the coding and names of New York State Next Generation Mathematics Learning Standards (2017), and New York State Next Generation English Language Arts Learning Standards (Revised 2017) that align to the performance expectations. An effort has been made to ensure that the mathematical skills students need for science were taught in a previous year where possible.

	Topic area		New York S	tate P-12 Science Learning Standard	
			HS.	Structure and Properties of Matter	
Stud Perf Expe	lent ormance ectations (PE)	Students who HS-PS1-1.	demonstrate understanding can: Use the periodic table as a mode electrons in the outermost energy could indude reactivity of metals, types of born to make more interesting. Assessment does not	el to predict the relative properties of element gy level of atoms. (Caritaton Statement: Durques of a torned, numbers of bonds formed, and reactions with owners) include caritations indentification of projection arrange based on	is based on the patterns of reperties that could be predicted from patterns (Assessment Boundary: Assessment is limited after trends).
HS-P51-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the scale to infer the strength of electrical forces between particles. (Cardiator Statement: Implasts on unders) and indicates expectations that expectations that and electronical to the strength of the strength					
are di	fferent from	¥	[Assessment Boundary: Assessment does not redinative decays.]	include quantitative calculation of energy released. Assessment is	limited to alpha, beta, positron, and gamma
Science	ext Generation e Standards.	HS-P52-6.	Communicate scientific and tech the functioning of designed mail functions of the mainul. Complex guident of long channel notecides, aggiverniaceutor	hnical information about why the particulate- terial Caefication Statement: Emphasis is on the attack Cole why electrical conductive materials are other made of met a re-despined to interact with specific measures () (Assessment to	level structure is important in e and republive forces that determine the I, finitise but durable maternials are made up undary: Assessment is limited to provided
An aster	isk indicates an	HS-PS1-9	Analyze data to support the claim	m that the combined gas law describes the re	lationships among volume,
engineer	ring connection	-	pressure, and temperature for a The relationships of the variables in the combin	simple of an ideal gas. (Clarification Statement: Real ga red gas law may be described both qualitatively and quantitatively	ses may be included at conditions near STP. (Assessment Boundary: Assessment is limited
to a prac	tice or	HS-PS1-10	Use evidence to support claims r	regarding the formation, properties and beha	viors of solutions at bulk scales.
disciplina	ary core idea.	14	 process and conductivity. Examples of physical process and conductivity. Examples of solution 	interest could include companye properties, degree or saturation introdes could include solid-liquid, liquid-liquid, and sate-liquid solution	pressure between or solutions, solvation and. Concentrations can be quantitatively instead to explain the statements of bolism
Clasificat	tion	The	point elevation and freezing point depression.]	d using the following elements from the NRC document A frame	work for K-12 Science Education
Clarificat	tion	Science	and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
avample	cand	Developing and Modeling in 9–12 b	Using Models builds on K-8 and progresses to using,	PS1.A: Structure and Properties of Hatter • Each atom has a charged substructure consisting of a	Patterns • Different patterns may be observed at.
example	s anu al guidance	synthesizing, and d relationships among	seveloping models to pearlist and show is variables between firsterns and their	nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1)	each of the scales at which a system is studied and can provide evidence for
audition	ai guidance.	Develop a mode	i based or evidence to illustrate the	 The periodic table orders elements horizontails by the number of protons in the atom's nucleus and places 	causality in explanations of phenomena. (HS-PS1-11)(HS-PS1-31(HS-PS1-03)
The Asse	essment	system. (HS-PS) • Use a model to-	1-12 Sindict the relationships between systems or	those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer der throught of the state of the	 Mathematical representations can be used to identify certain patterns (HS-PSI-9)
Boundar	ies delineate	between settion Planning-find Carry	nents of a system. (HS-PSI-1) ying Out Investigations	 The structure and interactions of matter at the bulk scale are determined by electrical forces within and 	 In nuclear processes, atoms are not conserved, but the total number of
content	limits of	Playeting and carry proprietices and pr	ing out investigations in 9-12 builds on K-8 represenses to include investigations that provide	between atoms. (HS-PS1-3), (secondary to HS-PS2-6) • (NYSED) The concept of an ideal gas is a model to	protons plus neutrons is conserved. (HS- PS1-8)
concept	s that may be	empirical models.	et conceptual, mathematical, physical, and	explain behavior of cases. A real cas is most like an ideal cas when the real cas is at low pressure and high	Structure and Function Investigating or designing new systems or
assessed	in large-scale	collaboratively I evidence, and it	to produce data to serve as the basis for in the design; decide on types, how much, and	(NYSED) Solutions duracteristic properties that	of the properties of different materials, the
assessm	ents	accuracy of data and consider lim	a needed to produce reliable measurements mitations on the precision of the data (e.g.,	can be described quantitatively and quantitatively. (HS+S1- 10) 101 C. Martinar Procession	connections of components to reveal its service and/or other a review (HS)
Found	lation box:	number of briefs accordingly. (HI Analyzing and Inte Analyzing data in 5	s, cost, risk, time), and refine the design 5-PSI-3) spectrag Data 9-12 builds on K-8 and progresses to builds of sticked works the resonances of	P3.1.4: Inscreen Processes Nuclear processes, inducing fusion, fission, and rackactive decays of anatobic nuclei, involve release or absorption of energy. The total number of neutrons dus protons does not change in any nuclear process. (HS-P53- protons does not change in any nuclear process. (HS-P53- protons does not change in any nuclear process. (HS-P53- protons does not change in any nuclear process.) (HS-P53- pr	PS2-6)
Design	his practice	data sets for consist analyze data.	stency, and the use of models to generate and	PS2.8: Types of Interactions	Designates which
uses t	nis practice.	Analyse data usin compartational, m relative compartational, relative comparts this approximation of the comparts of the second comparts of the second compart	ng took, suchrologies, and/or models (e.g., uthernatical) in order to make valid and Cames or determine an optimal disgle solution. next from Evidence wert from Evidence into the evidence in 9–12 builds on K-8 systemest to using a sprocriste and sufficient offic reasoning to defind and ortigue Game both relatival and designed works. Arguments in current scientific or heatorical spisodes in	Amaton and reputation between electric charges at the atoms case exclaim the traveation, properties, and transformations of nature, as well as the contact forms between neutrini objects. Boundary 19:67-51- 12.Jecondary 19:67-552-51, PEP-52-63. Foundation box: Designates which PE incorporates this disciplinary corre idea (DCI)	PE incorporates this crosscutting concept.
		Concernence of the case of the concernence of the c	ense, example, and reasoning service Currently isome or solutions to determine the merits of PS1-100 addies, and Communicating Information in 5–12 programmers and printing Information in 5–12 programmers to evaluating the validity and	(NYSED) indicates New York specific wording.	54

Diagram 1: the New York State P-12 Science Learning Standards

*The performance expectations marked with an advala integrate traditional science context with engineering through a Practice or Disciplinary Core Idea. The text in the "Displanary Core Idea" section is reproduced vehiclin for A Pranework for K L3 Science Education: Practice, Crust-Cutting Corrought, and Core Ideas.

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Framework	Framework [.]	Framework	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
Systems	HS-ESS1-1	Developing and Using	ESS1.A: The Universe	Scale, Proportions	8: 200-203, 212-215
		Models	and Its Stars;	and Quantity	
			PS3.D: Energy in		
			Chemical Process and		
			Everyday Life		
HS. Space Systems	HS-ESS1-2	Constructing	ESS1.A: The Universe		
		Explanations and	and Its Stars;		8: 200-206
		Designing Solutions			
			PS4.B:	Connections to	
			Electromagnetic	Engineering,	
			Radiation	Technology, and	
				Applications of	
				Science	
				Interdependence of	
				Science, Engineering	
				and Technology;	
				Energy and Matter;	
				Connection to Nature	
				of Science Scientific	
				Knowledge Assumes	
				an Order and	
LIC Cases Sustance		Obtaining Evaluating	FCC1 A. The Universe	France And Matter	8, 200, 201
пр. space Systems	пэ-гээт-з	optaining, Evaluating	ESST.A: THE UNIVERSE	Energy and Matter;	8.200-201
		Information	and its stars		
		mormation			

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
HS. Space Systems	HS-ESS1-4	Using Mathematics and Computational Thinking	ESS1.B: Earth and The Solar System	Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering and Technology; Scale, Proportions and Quantity	8: 208-209
HS. History of Earth	HS-ESS1-5	Engaging in Argument from Evidence	ESS1.C: The History of Planet Earth; ESS2.B: Plate Tectonics and Large- Scale System Interactions; PS1.C: Nuclear Processes	Patterns	10: 256-260 12: 342-347 14: 399-401, 415-426
HS. History of Earth	HS-ESS1-6	Constructing Explanations and Designing Solutions; Connection to Nature of Science: Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	ESS1.C: The History of Planet Earth	Stability and Change	9: 195-199, 203-206 14: 415-426

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
HS. Space Systems	HS-ESS1-7	Constructing	ESS1.B: Earth and	Patterns	
		Explanations and	The Solar System		
		Designing Solutions;			
HS. History of Earth	HS-ESS2-1	Developing and Using	ESS2.A: Earth	Stability and Change	9: 241-244
		Models	Materials and		10: 250-279
			Systems;		11: 289-322
			ESS2.B: Plate		12: 336-345, 350-352
			Tectonics and Large-		13: 363-389
			Scale System		14: 415-426
			Interactions		
HS. Earth's Systems	HS-ESS2-2	Analyzing and	ESS2.A: Earth	Stability and Change;	3: 66-70, 72-76
		Interpreting Data	Materials and	Connections to	4: 102-106
			Systems	Engineering,	5: 115-135
				Technology, and	6: 155-1649: 241-244
				Applications of	11: 317-319
				Science	12: 342-352
				Interdependence of	
				Science, Engineering,	
				and Technology	
Earth's Systems	HS-ESS2-3	Developing and Using	ESS2.A: Earth	Energy and Matter;	9: 241-244
		Models; Connection	Materials and	Connections to	11: 317-319
		to Nature of Science	Systems;	Engineering,	12: 342-352
		Scientific Knowledge	ESS2.B: Plate	Technology, and	
		is Based on Empirical	Tectonics and Large-	Applications of	
		Evidence	Scale System	Science	
			Interactions;	Interdependence of	
			PS4.A: Wave	Science, Engineering,	
			Properties	and Technology	

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
HS. Earth's Systems	HS-ESS2-5	Planning and	ESS2.C: The Roles of	Structure and	2:24-35
		Carrying Out	Water in Earth's	Function	3: 58-76
		Investigations	Surface Processes		4: 99-103
					5: 116-124, 133-135
					6: 165-175
HS. Earth's Systems	HS-ESS2-6	Developing and Using	ESS2.D: Weather and	Energy and Matter	5: 124-135
		Models	climate	Physical and	6: 160-163
				chemical aspects of	
				the geochemical	
				cycling of carbon.	
HS. Earth's Systems	HS-ESS2-7	Engaging in	ESS2.D: Weather and	Stability and Change	2: 36-40
		Argument from	climate;	Changes in the	5: 127-135
		Evidence	ESS2.E: Biogeology	atmosphere from	6: 165-178
				plants and other	13: 387-389
				organisms along with	14: 425-426
				feedback	15: 447-453
				mechanisms.	16: 479-485
HS. Weather and	HS-ESS2-4	Developing and Using	ESS2.A: Earth	Cause and Effect	3: 66-76
Climate		Models; Connections	Materials and		4: 94-98
		to Nature of Science	Systems;		5: 115-123
		Scientific Knowledge	ESS2.D: Weather and		6: 165-178
		is Based on Empirical	climate;		
		Evidence	ESS1.B: Earth and		
			The Solar System		
HS. Weather and	HS-ESS2-8	Obtaining,	ESS2.D: Weather and	Patterns; Cause and	4: 97-98, 102-103,
Climate		Evaluating, and	climate	Effect	104-106

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
		Communicating			
		Information			
HS. Weather and	HS-ESS3-5	Analyzing and	ESS3.D: Global	Stability and Change	6: 165-178
Climate		Interpreting Data;	Climate Change		
		Connections to			
		Nature of Science			
		Scientific			
		Investigations Use a			
		Variety of Methods;			
		Scientific Knowledge			
		is Based on Empirical			
		Evidence			
HS. Human	HS-ESS3-1	Constructing	ESS3.A: Natural	Cause and Effect;	2: 18-20, 38-40
Sustainability		Explanations and	Resources;	Connections to	10: 250-253, 283-284
		Designing Solutions	ESS3.B: Natural	Engineering,	11: 290-292, 321-322
			Hazards	Technology, and	13: 358-361, 387-389
				Applications of	15: 432-435, 444-456
				Science Influence of	16: 461-468, 479-485
				Science, Engineering,	
				and Technology on	
				Society and the	
		Francisci in			16, 402, 404
HS. Human	HS-ESS3-2	Engaging in	ESS3.A: Natural	Connections to	16: 482-484
Sustainability		Argument from	Resources;	Engineering,	
		Evidence	EIST.B: Developing	Applications of	
			Possible Solutions	Applications of	
				Science influence of	
				and Tashnalagu ar	
				and rechnology on	

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
				Society and the Natural World; Connections to Nature of Science Science Addresses Questions About the Natural and Material World	
HS. Human Sustainability	HS-ESS3-3	Using Mathematics and Computational Thinking	ESS3.C: Human Impacts on Earths Systems	Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World; Connections to Nature of Science Science is a Human Endeavor;	2:18-23 5: 127-132 6: 165-178 16: 463-467
HS. Human Sustainability	HS-ESS3-4	Constructing Explanations and Designing Solutions	ESS3.C: Human Impacts on Earths Systems	Stability and Change; Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering,	2: 38-40 13: 387-389 16: 479-481

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
				and Technology on	
				Society and the	
				Natural World	
HS. Human	HS-ESS3-6	Using Mathematics	ESS3.D: Global	Systems and System	5: 127-135
Sustainability		and Computational	Climate Change;	Models	6: 165-175
		Thinking	ESS2.D: Weather and		
			climate		
HS. Engineering	HS-ETS1-1	Asking Questions and	ETS1.A: Defining and	Connections to	
Design		Defining Problems	Delimiting	Engineering,	
			Engineering	Technology, and	
			Problems	Applications of	
				Science Influence of	
				Science, Engineering,	
				and Technology on	
				Society and the	
				Natural World	
Design	HS-ETS1-2	Constructing	ETS1.C: Optimizing		
		Explanations and	the Design Solution		
		Designing Solutions			
HS. Engineering	HS-ETS1-3	Constructing	ETS1.B: Developing	Connections to	
Design		Explanations and	Possible Solutions	Engineering,	
		Designing Solutions		Technology, and	
				Applications of	
				Science influence of	
				Science, Engineering,	
				and Technology on	
				Society and the	
				Natural World	

Торіс	PE #	K-12 Science	K-12 Science	K-12 Science	Location in EDC Earth
		Education	Education	Education	Science
		Framework:	Framework:	Framework:	(Revised 2022)
		Scientific and	Disciplinary Core	Crosscutting	Chapter and pages
		Engineering Practices	Ideas	Concepts	
HS. Engineering	HS-ETS1-4.	Using Mathematics	ETS1.B: Developing	Systems and System	
Design		and Computational	Possible Solutions	Models	
		Thinking			