Utah Science with Engineering Education (SEEd) Standards Correlation to *PhD Science*™

Green indicates that *PhD Science*™ fully addresses the standard within the grade level.

Blue indicates that *PhD Science* covers the standard but in a different grade level.

Yellow indicates that *PhD Science* partially covers the standard within the grade level.

Red indicates that *PhD Science* does not cover the standard.

Key: Module (M), Lesson (L)

PhD Science Level 3

The Grade 3 Utah Science with Engineering Education (SEEd) Standards are entirely covered by the Level 3 *PhD Science* curriculum. A detailed analysis of alignment appears in the table below.

Grade 3 Standards			**Aligned *PhD Science* Lessons**
Strand 3.1 Weather and Climate Patterns			
3.1.1	Analyze and interpret data to reveal patterns that indicate typical weather conditions expected during a particular season.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29
3.1.2	Obtain and communicate information to describe climate patterns in different regions of the world.		Level 3 M1 L11–L15 Level 3 M1 L27–L29
3.1.3	Design a solution that reduces the effects of a weather-related hazard.		Level 3 M1 L1–L3 Level 3 M1 L16–L29
Engineering Expectations			
3.1.3	Define the problem, identify criteria and constraints, develop possible solutions, analyze data from testing solutions, and propose modifications for optimizing a solution.		Level 3 M1 L21–L26 Level 3 M2 L23–L27 Level 3 M4 L23–L27
Strand 3.2 Effects of Traits on Survival			
3.2.1	Develop and use models to describe changes that organisms go through during their life cycles.		Level 3 M3 L7–L8 Level 3 M3 L23–L28
3.2.2	Analyze and interpret data to identify patterns of traits that plants and animals have inherited from parents.		Level 3 M3 L1–L6 Level 3 M3 L14–L18 Level 3 M3 L26–L28
3.2.3	Construct an explanation that the environment can affect the traits of an organism.		Level 3 M3 L9–L13 Level 3 M3 L19–L20 Level 3 M3 L26–L28
3.2.4	Construct an explanation showing how variations in traits and behaviors can affect the ability of an individual to survive and reproduce.		Level 3 M3 L21–L28

3.2.5	Engage in argument from evidence that in a particular habitat (system) some organisms can survive well, some survive less well, and some cannot survive at all.		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–L19 Level 3 M2 L22–L28
3.2.6	Design a solution to a problem caused by a change in the environment that impacts the types of plants and animals living in that environment.		Level 3 M2 L16–L28
Engineering Expectations			
3.2.6	Define the problem, identify criteria and constraints, and develop possible solutions.		Level 3 M1 L21–L26 Level 3 M4 L23–L27
Strand 3.3 Force Affects Motion			
3.3.1	Plan and carry out investigations that provide evidence of the effects of balanced and unbalanced forces on the motion of an object.		Level 3 M4 L10–L18 Level 3 M4 L28–L30
3.3.2	Analyze and interpret data from observations and measurements of an object's motion to identify patterns in its motion that can be used to predict future motion.		Level 3 M4 L1–L9 Level 3 M4 L28–L30
3.3.3	Construct an explanation that the gravitational force exerted by Earth causes objects to be directed downward, toward the center of the spherical Earth.		Level 5 M4 L3–L4 Level 5 M4 L24–L26
3.3.4	Ask questions to plan and carry out an investigation to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.		Level 3 M4 L19–L21 Level 3 M4 L28–L30
3.3.5	Design a solution to a problem in which a device functions by using scientific ideas about magnets.		Level 3 M4 L22–L30
Engineering Expectations			
3.3.5	Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution.		Level 3 M1 L21–L26 Level 3 M2 L23–L27 Level 3 M4 L23–L27

Science and Engineering Practices			**Aligned *PhD Science* Lessons**
1	Asking Questions or Defining Problems • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.		Level 3 M1 L1–L3 Level 3 M1 L21–L26 Level 3 M2 L1–L2 Level 3 M3 L1–L3 Level 3 M3 L12–L13 Level 3 M4 L1–L3 Level 3 M4 L7–L9 Level 3 M4 L15–L16 Level 3 M4 L19–L30
2	Developing and Using Models • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena.		Level 3 M1 L1–L3 Level 3 M1 L19–L20 Level 3 M2 L1–L3 Level 3 M2 L6–L12 Level 3 M2 L22–L25 Level 3 M3 L7–L11 Level 3 M3 L21–L25

	• Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.		Level 3 M4 L1–L3 Level 3 M4 L17–L18 Level 3 M4 L23–L27
3	Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 3 M2 L4–L5 Level 3 M3 L12–L13 Level 3 M4 L7–L18 Level 3 M4 L23–L30
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 3 M1 L4–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L3–L8 Level 3 M2 L16–L19 Level 3 M3 L4–L8 Level 3 M3 L14–L20 Level 3 M4 L4–L9
6	Constructing Explanations and Designing Solutions • Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		Level 3 M1 L13–L15 Level 3 M1 L18 Level 3 M1 L21–L29 Level 3 M2 L6–L8 Level 3 M2 L22–L28 Level 3 M3 L9–L11 Level 3 M3 L14–L15 Level 3 M3 L21–L28 Level 3 M4 L10–L14 Level 3 M4 L19–L21 Level 3 M4 L28–L30
7	Engaging in Argument from Evidence • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.		Level 3 M1 L21–L26 Level 3 M2 L9–L15 Level 3 M2 L20–L21 Level 3 M3 L16–L20 Level 3 M4 L10–L14

8	Obtaining, Evaluating, and Communicating Information • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		Level 3 M1 L16–L17 Level 3 M2 L13–L15 Level 3 M2 L20–L21 Level 3 M4 L22

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS2 Motion and Stability: Forces and Interactions			
PS2.A	**Forces and Motion**		
	Each force acts on one particular object and has both a strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.		Level 3 M4 L10–L18 Level 3 M4 L28–L30
	The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.		Level 3 M4 L1–L9 Level 3 M4 L28–L30
PS2.B	**Type of Interactions**		
	Objects in contact exert forces on each other.		Level 3 M4 L10–L18 Level 3 M4 L28–L30
	Electrical and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.		Level 3 M4 L19–L30
PS2.C	**Stability and Instability in Physical Systems**		
	A system can change as it moves in one direction (e.g., a ball rolling down a hill), shifts back and forth (e.g., a swinging pendulum), or goes through cyclical patterns (e.g., day and night). Examining how the forces on and within the system change as it moves can help to explain the system's patterns of change.		Level 3 M4 L1–L9 Level 3 M4 L28–L30
LS1 Molecules to Organisms			
LS1.B	**Growth and Development of Organisms**		
	Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.		Level 3 M3 L7–L8 Level 3 M3 L23–L28
LS2 Ecosystems			
LS2.C	**Ecosystem Dynamics, Functioning, and Resilience**		
	When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some		Level 3 M2 L16–L28

	organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.		
LS2.D	**Social Interactions and Group Behavior**		
	Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.		Level 3 M2 L13–L15 Level 3 M2 L22–L28
LS3 Heredity			
LS3.A	**Inheritance of Traits**		
	Many characteristics of organisms are inherited from their parents.		Level 3 M3 L14–L18 Level 3 M3 L26–L28
	Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.		Level 3 M3 L9–L13 Level 3 M3 L19–L20 Level 3 M3 L26–L28
LS3.B	**Variation of Traits**		
	Different organisms vary in how they look and function because they have different inherited information.		Level 3 M3 L1–L6 Level 3 M3 L14–L18 Level 3 M3 L23–L28
	The environment also affects the traits that an organism develops.		Level 3 M3 L9–L13 Level 3 M3 L19–L20 Level 3 M3 L26–L28
LS4 Biological Evolution			
LS4.A	**Evidence of Common Ancestry and Diversity**		
	Some kinds of plants and animals that once lived on Earth are no longer found anywhere.		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–L19 Level 3 M2 L22–L28
	Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.		Level 3 M2 L1–L8 Level 3 M2 L26–L28
LS4.B	**Natural Selection**		
	Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.		Level 3 M3 L21–L28
LS4.C	**Adaptation**		
	For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–L19 Level 3 M2 L22–L28
LS4.D	**Biodiversity and Humans**		
	Populations live in a variety of habitats, and change in those habitats affects the organisms living there.		Level 3 M2 L16–L21 Level 3 M2 L26–L28
ESS2 Earth's Systems			
ESS2.D	**Weather and Climate**		
	Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29
	Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.		Level 3 M1 L11–L15 Level 3 M1 L27–L29

ESS3 Earth and Human Activity			
ESS3.B	**Natural Hazards**		
	A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.		Level 3 M1 L1–L3 Level 3 M1 L16–L29
ETS1 Engineering Design			
ETS1.A	**Defining and Delimiting Engineering Problems**		
	Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.		Level 3 M1 L21–L26
ETS1.B	**Developing Possible Solutions**		
	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.		Level 3 M1 L21–L26
	At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.		Level 3 M2 L23–L27
	Tests are often designed to identify failure points or difficulties, which suggest the elements of a design that need to be improved.		Level 3 M4 L23–L27
ETS1.C	**Optimizing the Design Solution**		
	Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		Level 3 M4 L23–L27

Crosscutting Concepts		**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.	Level 3 M1 L11–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L3–L8 Level 3 M2 L13–L15 Level 3 M3 L1–L8 Level 3 M3 L14–L18 Level 3 M3 L26–L28 Level 3 M4 L1–L9 Level 3 M4 L28–L30
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.	Level 3 M1 L1–L3 Level 3 M1 L16–L18 Level 3 M1 L21–L29 Level 3 M2 L9–L12 Level 3 M2 L16–L28 Level 3 M3 L9–L13 Level 3 M3 L19–L25 Level 3 M4 L1–L3 Level 3 M4 L10–L30

4	Systems and System Models • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 3 M1 L1–L3 Level 3 M1 L16–L20 Level 3 M2 L6–L15 Level 3 M2 L20–L28 Level 3 M3 L9–L11 Level 3 M4 L1–L30
6	Structure and Function • Different materials have different substructures, which can sometimes be observed. • Substructures have shapes and parts that serve functions.		Level 3 M1 L21–L26 Level 3 M2 L1–L3 Level 3 M2 L9–L12 Level 3 M3 L4–L6 Level 3 M3 L21–L28
7	Stability and Change • Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.		Level 3 M1 L4–L15 Level 3 M1 L27–L29 Level 3 M2 L16–L19 Level 3 M3 L7–L8 Level 3 M3 L12–L13 Level 3 M3 L19–L20 Level 3 M3 L26–L28

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Key: Module (M), Lesson (L)

PhD Science Level 4

The Grade 4 Utah Science with Engineering Education (SEEd) Standards are fully covered by the *PhD Science* curriculum but some out of grade level. A detailed analysis of alignment appears in the table below.

Grade 4 Standards			**Aligned *PhD Science* Lessons**
Strand 4.1 Organisms Functioning in Their Environment			
4.1.1	Construct an explanation from evidence that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.		Level 4 M3 L1–L6 Level 4 M3 L20 Level 4 M3 L26–L31
4.1.2	Develop and use a model of a system to describe how animals receive different types of information from their environment through their senses, process the information in their brain, and respond to the information.		Level 4 M3 L1–L6 Level 4 M3 L15–L25 Level 4 M3 L29–L31
4.1.3	Analyze and interpret data from fossils to provide evidence of the stability and change in organisms and environments from long ago.		Level 3 M2 L1–L8 Level 3 M2 L26–L28
4.1.4	Engage in argument from evidence based on patterns in rock layers and fossils found in those layers to support an explanation that environments have changed over time.		Level 4 M1 L1–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
Strand 4.2 Energy Transfer			
4.2.1	Construct an explanation to describe the cause and effect relationship between the speed of an object and the energy of that object.		Level 4 M2 L6–L7 Level 4 M2 L24–L26
4.2.2	Ask questions and make observations about the changes in energy that occur when objects collide.		Level 4 M2 L8–L9 Level 4 M2 L24–L26
4.2.3	Plan and carry out an investigation to gather evidence from observations that energy can be transferred from place to place by sound, light, heat, and electrical currents.		Level 4 M2 L1–L5 Level 4 M2 L10–L11 Level 4 M2 L24–L26
4.2.4	Design a device that converts energy from one form to another.		Level 4 M2 L12–L26
Engineering Expectations			
4.2.4	Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution.		Level 4 M1 L12–L17 Level 4 M2 L17–L23

Strand 4.3 Wave Patterns			
4.3.1	Develop and use a model to describe the regular patterns of waves.		Level 4 M3 L7–L14 Level 4 M3 L29–L31
4.3.2	Develop and use a model to describe how visible light waves reflected from objects enter the eye causing objects to be seen.		Level 4 M4 L1–L13 Level 4 M4 L20–L26
4.3.3	Design a solution to an information transfer problem using wave patterns.		Level 4 M4 L14–L19 Level 4 M4 L24–L26
Engineering Expectations			
4.3.3	Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution.		Level 4 M1 L12–L17 Level 4 M2 L17–L23
Strand 4.4 Observable Patterns in the Sky			
4.4.1	Construct an explanation that differences in the apparent brightness of the Sun compared to other stars is due to the relative distance (scale) of stars from Earth.		Level 5 M4 L18–L19 Level 5 M4 L24–L26
4.4.2	Analyze and interpret data of observable patterns to show that Earth rotates on its axis and revolves around the Sun.		Level 5 M4 L1–L2 Level 5 M4 L5–L18 Level 5 M4 L20–L26

Science and Engineering Practices			**Aligned *PhD Science* Lessons**
1	Asking Questions and Defining Problems • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.		Level 4 M1 L1–L2 Level 4 M2 L1–L3 Level 4 M2 L8–L9 Level 4 M3 L1–L3 Level 4 M3 L15–L19 Level 4 M4 L1–L2
2	Developing and Using Models • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena. • Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.		Level 4 M1 L1–L2 Level 4 M2 L1–L3 Level 4 M2 L8–L11 Level 4 M2 L15–L16 Level 4 M3 L1–L3 Level 4 M3 L7–L11 Level 4 M4 L1–L8 Level 4 M4 L10–L23
3	Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data.		Level 4 M1 L6–L11 Level 4 M1 L21–L22 Level 4 M2 L6–L7 Level 4 M2 L10–L14 Level 4 M3 L15–L19 Level 4 M4 L7–L9

	• Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 4 M4 L14–L16 Level 4 M4 L20–L23
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 4 M1 L12–L20 Level 4 M1 L23–L24 Level 4 M4 L10–L13
5	Using Mathematics and Computational Thinking • Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success. • Organize simple data sets to reveal patterns that suggest relationships. • Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems. • Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.		Level 4 M2 L8–L9
6	Constructing Explanations and Designing Solutions • Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		Level 4 M1 L3–L7 Level 4 M1 L12–L18 Level 4 M1 L21–L22 Level 4 M1 L25–L27 Level 4 M2 L4–L5 Level 4 M2 L15–L26 Level 4 M3 L24–L25 Level 4 M3 L29–L31 Level 4 M4 L14–L26
7	Engaging in Argument from Evidence • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.		Level 4 M3 L4–L5 Level 4 M3 L21–L23 Level 4 M3 L26–L28 Level 4 M4 L7–L8

8	Obtaining, Evaluating, and Communicating Information • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		Level 4 M1 L3–L5 Level 4 M1 L23–L24 Level 4 M3 L4–L6 Level 4 M3 L10–L11 Level 4 M3 L20–L23 Level 4 M3 L26–L28 Level 4 M4 L17–L19

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS3 Energy			
PS3.A	**Definitions of Energy**		
	The faster a given object is moving, the more energy it possesses.		Level 4 M2 L6–L9 Level 4 M2 L12–L16 Level 4 M2 L24–L26
	Energy can be moved from place to place by moving objects or through sound, light, or electrical currents.		Level 4 M2 L1–L3 Level 4 M2 L10–L11 Level 4 M2 L15–L16 Level 4 M2 L24–L26
PS3.B	**Conservation of Energy and Energy Transfer**		
	Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.		Level 4 M2 L1–L5 Level 4 M2 L8–L9 Level 4 M2 L24–L26
	Light also transfers energy from place to place.		Level 4 M2 L10–L11 Level 4 M2 L24–L26
	Energy can also be transferred from place to place by electrical currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.		Level 4 M2 L1–L3 Level 4 M2 L10–L26
PS3.C	**Relationship Between Energy and Forces**		
	When objects collide, contact forces transfer energy so as to change the objects' motions.		Level 4 M2 L8–L9 Level 4 M2 L24–L26
PS3.D	**Energy in Chemical Processes and Everyday Life**		
	The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.		Level 4 M2 L12–L14 Level 4 M2 L24–L26

PS4 Waves and their Applications in Technologies for Information Transfer			
PS4.A	**Wave Properties**		
	Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets the beach.		Level 4 M3 L7–L11
	Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).		Level 4 M3 L7–L11 Level 4 M3 L29–L31
PS4.B	**Electromagnetic Radiation**		
	An object can be seen when light reflected from its surface enters the eyes.		Level 4 M4 L1–L13 Level 4 M4 L20–L26
PS4.C	**Information Technologies and Instrumentation**		
	Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.		Level 4 M4 L14–L19 Level 4 M4 L24–L26
LS1 Molecules to Organisms			
LS1.A	**Structure and Function**		
	Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.		Level 4 M3 L1–L6 Level 4 M3 L20 Level 4 M3 L26–L31
LS1.D	**Information Processing**		
	Different sense receptors are specialized for particular kinds of information, which may then be processed by an animal's brain. Animals are able to use their perceptions and memories to guide their actions.		Level 4 M3 L1–L6 Level 4 M3 L15–L25 Level 4 M3 L29–L31 Level 4 M4 L10–L13
ESS1 Earth's Place in the Universe			
ESS1.C	**The History of Planet Earth**		
	Local, regional, and global patterns of rock formations reveal changes over time due to Earth's forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.		Level 4 M1 L1–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
ETS1 Engineering Design			
ETS1.A	**Defining and Delimiting Engineering Problems**		
	Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.		Level 4 M2 L17–L26
ETS1.B	**Developing Possible Solutions**		
	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.		Level 4 M1 L12–L17 Level 4 M4 L20–L23
	At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.		Level 4 M1 L12–L17 Level 4 M4 L20–L23
	Tests are often designed to identify failure points or difficulties, which suggest the elements of a design that need to be improved.		Level 4 M1 L12–L17 Level 4 M4 L20–L23

	Testing a solution involves investigating how well it performs under a range of likely conditions.		Level 4 M4 L12–L17 Level 4 M4 L20–L23
ETS1.C	**Optimizing the Design Solution**		
	Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		Level 4 M1 L12–L17 Level 4 M4 L20–L23

Crosscutting Concepts			**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.		Level 4 M1 L1–L5 Level 4 M1 L18–L22 Level 4 M2 L4–L5 Level 4 M2 L8–L11 Level 4 M2 L24–L26 Level 4 M3 L1–L3 Level 4 M3 L7–L11 Level 4 M3 L20 Level 4 M3 L24–L28 Level 4 M4 L1–L4 Level 4 M4 L7–L8 Level 4 M4 L17–L23
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.		Level 4 M1 L6–L17 Level 4 M1 L19–L20 Level 4 M1 L23–L27 Level 4 M2 L1–L7 Level 4 M2 L10–L14 Level 4 M2 L24–L26 Level 4 M3 L6–L11 Level 4 M3 L15–L23 Level 4 M4 L3–L16 Level 4 M4 L24–L26
3	Scale, Proportion, and Quantity • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.		Level 4 M1 L3–L5
4	Systems and System Models • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 4 M1 L1–L2 Level 4 M1 L12–L17 Level 4 M1 L21–L24 Level 4 M2 L1–L11 Level 4 M2 L15–L26 Level 4 M3 L4–L5 Level 4 M3 L7–L9 Level 4 M3 L15–L19 Level 4 M3 L21–L23 Level 4 M3 L26–L31 Level 4 M4 L1–L8 Level 4 M4 L10–L23

5	Energy and Matter • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects.		Level 4 M2 L1–L3 Level 4 M2 L8–L26 Level 4 M3 L1–L3 Level 4 M3 L10–L19
6	Structure and Function • Different materials have different substructures, which can sometimes be observed. • Substructures have shapes and parts that serve functions.		Level 4 M3 L4–L6 Level 4 M3 L20 Level 4 M3 L24–L25 Level 4 M3 L29–L31 Level 4 M4 L9 Level 4 M4 L24–L26
7	Stability and Change • Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.		Level 4 M1 L3–L11 Level 4 M1 L18–L20 Level 4 M1 L25–L27

Utah Science with Engineering Education (SEEd) Standards Correlation to *PhD Science*™

Green indicates that *PhD Science*™ fully addresses the standard within the grade level.

Blue indicates that *PhD Science* covers the standard but in a different grade level.

Yellow indicates that *PhD Science* partially covers the standard within the grade level.

Red indicates that *PhD Science* does not cover the standard.

Key: Module (M), Lesson (L)

PhD Science Level 5

The Grade 5 Utah Science with Engineering Education (SEEd) Standards are fully covered by the *PhD Science* curriculum but some out of grade level. A detailed analysis of alignment appears in the table below.

Grade 5 Standards			**Aligned *PhD Science* Lessons**
Strand 5.1 Characteristics and Interactions of Earth's Systems			
5.1.1	Analyze and interpret data to describe patterns of Earth's features.		Level 4 M1 L18–L20 Level 4 M1 L25–L27
5.1.2	Use mathematics and computational thinking to compare the quantity of saltwater and freshwater in various reservoirs to provide evidence for the distribution of water on Earth.		Level 5 M3 L4–L5 Level 5 M3 L19–L27
5.1.3	Ask questions to plan and carry out investigations that provide evidence for the effects of weathering and the rate of erosion on the geosphere.		Level 4 M1 L6–L11 Level 4 M1 L25–L27
5.1.4	Develop a model to describe interactions between Earth's systems including the geosphere, biosphere, hydrosphere, and/or atmosphere.		Level 5 M3 L1–L3 Level 5 M3 L6–L13 Level 5 M3 L19–L27
5.1.5	Design solutions to reduce the effects of naturally occurring events that impact humans.		Level 4 M1 L12–L17 Level 4 M1 L25–L27
Engineering Expectations			
5.1.5	Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution.		Level 5 M1 L18–L22 Level 5 M3 L19–L23
Strand 5.2 Properties and Changes of Matter			
5.2.1	Develop and use a model to describe that matter is made of particles on a scale that is too small to be seen.		Level 5 M1 L5–L10 Level 5 M1 L23–L26
5.2.2	Ask questions to plan and carry out investigations to identify substances based on patterns of their properties.		Level 5 M1 L1–L4 Level 5 M1 L11–L17 Level 5 M1 L23–L26
5.2.3	Plan and carry out investigations to determine the effect of combining two or more substances.		Level 5 M1 L1–L2 Level 5 M1 L13–L26

5.2.4	Use mathematics and computational thinking to provide evidence that regardless of the type of change that occurs when heating, cooling, or combining substances, the total weight of matter is conserved.		Level 5 M1 L9–L17 Level 5 M1 L23–L26
Strand 5.3 Cycling of Matter in Ecosystems			
5.3.1	Construct an explanation that plants use air, water, and energy from sunlight to produce plant matter needed for growth.		Level 5 M2 L3–L5 Level 5 M2 L20–L26
5.3.2	Obtain, evaluate, and communicate information that animals obtain energy and matter from the food they eat for body repair, growth, and motion and to maintain body warmth.		Level 5 M2 L15–L19 Level 5 M2 L24–L26
5.3.3	Develop and use a model to describe the movement of matter among plants, animals, decomposers, and the environment.		Level 5 M2 L1–L2 Level 5 M2 L6–L14 Level 5 M2 L24–L26
5.3.4	Evaluate design solutions whose primary function is to conserve Earth's environments and resources.		Level 5 M3 L14–L18 Level 5 M3 L24–L27
Engineering Expectations			
5.3.4	Define the problem, identify criteria and constraints, analyze available data on proposed solutions, and determine an optimal solution.		Level 5 M1 L18–L22 Level 5 M3 L19–L23

Science and Engineering Practices			**Aligned *PhD Science* Lessons**
1	Asking Questions and Defining Problems • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.		Level 5 M1 L1–L2 Level 5 M2 L1–L2 Level 5 M2 L21–L23 Level 5 M3 L1–L3 Level 5 M3 L19–L23 Level 5 M4 L1–L2 Level 5 M4 L13
2	Developing and Using Models • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena. • Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.		Level 5 M1 L1–L2 Level 5 M1 L5–L10 Level 5 M1 L13–L14 Level 5 M1 L23–L26 Level 5 M2 L1–L2 Level 5 M2 L6–L7 Level 5 M2 L14 Level 5 M2 L20 Level 5 M3 L1–L3 Level 5 M3 L6–L16 Level 5 M3 L19–L27 Level 5 M4 L1–L4 Level 5 M4 L7–L18 Level 5 M4 L20–L26

3	Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 5 M1 L13–L14 Level 5 M1 L18–L22 Level 5 M2 L3–L5 Level 5 M3 L10–L11 Level 5 M4 L5–L6 Level 5 M4 L18–L19
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 5 M1 L15–L17 Level 5 M2 L3–L5 Level 5 M2 L8–L13 Level 5 M2 L15–L17 Level 5 M3 L4–L5 Level 5 M3 L14–L16 Level 5 M4 L14–L15
5	Using Mathematics and Computational Thinking • Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success. • Organize simple data sets to reveal patterns that suggest relationships. • Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems. • Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.		Level 5 M1 L3–L4 Level 5 M1 L15–L22 Level 5 M3 L10–L11 Level 5 M3 L24–L27 Level 5 M4 L5–L6
6	Constructing Explanations and Designing Solutions • Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		Level 5 M1 L5–L6 Level 5 M1 L11–L12 Level 5 M1 L23–L26 Level 5 M2 L12–L13 Level 5 M2 L15–L17 Level 5 M2 L21–L26 Level 5 M3 L17–L23 Level 5 M4 L3–L4 Level 5 M4 L9–L12 Level 5 M4 L20–L26
8	Obtaining, Evaluating, and Communicating Information • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and		Level 5 M2 L6–L7 Level 5 M2 L10–L11 Level 5 M2 L18–L20 Level 5 M3 L9

	technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		Level 5 M3 L14–L16 Level 5 M3 L19–L27 Level 5 M4 L18–L19

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS1 Matter and Its Interactions			
PS1.A	**Structure and Properties of Matter**		
	Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model that shows gases are made from matter particles that are too small to see and that are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.		Level 5 M1 L5–L10 Level 5 M1 L23–L26
	The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.		Level 5 M1 L9–L17 Level 5 M1 L23–L26
	Measurements of a variety of properties can be used to identify materials.		Level 5 M1 L1–L4 Level 5 M1 L11–L17 Level 5 M1 L23–L26
PS1.B	**Chemical Reactions**		
	When two or more different substances are mixed, a new substance with different properties may be formed.		Level 5 M1 L1–L2 Level 5 M1 L15–L26
	No matter what reaction or change in properties occurs, the total weight of the substances does not change.		Level 5 M1 L9–L17 Level 5 M1 L23–L26
PS3 Energy			
PS3.D	**Energy in Chemical Processes and Everyday Life**		
	The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).		Level 5 M2 L6–L7 Level 5 M2 L15–L19 Level 5 M2 L24–L26
LS1 Molecules to Organisms			
LS1.C	**Organization for Matter and Energy Flow in Organisms**		
	Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.		Level 5 M2 L8–L9 Level 5 M2 L15–L19 Level 5 M2 L24–L26
	Plants acquire their material for growth chiefly from air and water.		Level 5 M2 L3–L5 Level 5 M2 L24–L26

LS2 Ecosystems			
LS2.A	**Interdependent Relationships in Ecosystems**		
	The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or their parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.		Level 5 M2 L1–L2 Level 5 M2 L8–L14 Level 5 M2 L20 Level 5 M2 L24–L26
LS2.B	**Cycles of Matter and Energy Transfer in Ecosystems**		
	Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment and release waste matter (gas, liquid, or solid) back into the environment.		Level 5 M2 L6–L7 Level 5 M2 L10–L14 Level 5 M2 L24–L26
ESS2 Earth's Systems			
ESS2.A	**Earth Materials and Systems**		
	Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.		Level 5 M3 L1–L13 Level 5 M3 L24–L27
ESS2.C	**The Roles of Water in Earth's Surface Processes**		
	Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.		Level 5 M3 L4–L5 Level 5 M3 L24–L27
ESS2.E	**Biogeology**		
	Living things affect the physical characteristics of their regions.		Level 4 M1 L6–L11 Level 4 M1 L25–L27
ESS3 Earth and Human Activity			
ESS3.A	**Natural Resources**		
	Energy and fuels humans use are derived from natural sources and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.		Level 4 M1 L21–L27
ESS3.B	**Natural Hazards**		
	A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.		Level 4 M1 L12–L17 Level 4 M1 L25–L27
ESS3.C	**Human Impacts on Earth Systems**		
	Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.		Level 5 M3 L14–L27

Engineering Design			
ETS1.A	**Defining and Delimiting Engineering Problems**		
	Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.		Level 5 M2 L21–L23
ETS1.B	**Developing Possible Solutions**		
	Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.		Level 5 M3 L18–L22
	At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.		Level 5 M2 L21–L23 Level 5 M3 L19–L23
	Tests are often designed to identify failure points or difficulties, which suggest the elements of a design that need to be improved.		Level 5 M1 L19–L23
ETS1.C	**Optimizing the Design Solution**		
	Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		Level 5 M1 L18–L22

Crosscutting Concepts			**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.		Level 5 M1 L7–L8 Level 5 M2 L1–L5 Level 5 M2 L8–L9 Level 5 M2 L15–L17 Level 5 M3 L6–L9 Level 5 M4 L1–L17 Level 5 M4 L20–L26
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.		Level 5 M1 L1–L2 Level 5 M1 L5–L6 Level 5 M1 L9–L10 Level 5 M1 L18–L22 Level 5 M2 L3–L7 Level 5 M2 L12–L13 Level 5 M2 L18–L23 Level 5 M3 L6–L8 Level 5 M3 L12–L18 Level 5 M4 L5–L6 Level 5 M4 L24–L26
3	Scale, Proportion, and Quantity • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.		Level 5 M1 L3–L4 Level 5 M1 L13–L17 Level 5 M1 L23–L26 Level 5 M2 L10–L11 Level 5 M3 L1–L5 Level 5 M3 L10–L11 Level 5 M3 L24–L27

			Level 5 M4 L18–L19 Level 5 M4 L24–L26
4	Systems and System Models • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 5 M1 L3–L4 Level 5 M1 L15–L17 Level 5 M2 L1–L2 Level 5 M2 L6–L11 Level 5 M2 L14 Level 5 M2 L18–L19 Level 5 M2 L24–L26 Level 5 M3 L1–L9 Level 5 M3 L12–L13 Level 5 M3 L19–L27 Level 5 M4 L1–L2 Level 5 M4 L7–L23
5	Energy and Matter • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects.		Level 5 M1 L5–L8 Level 5 M1 L13–L14 Level 5 M1 L23–L26 Level 5 M2 L6–L11 Level 5 M2 L14–L19 Level 5 M2 L24–L26 Level 5 M3 L10–L11 Level 5 M4 L3–L4
6	Structure and Function • Different materials have different substructures, which can sometimes be observed. • Substructures have shapes and parts that serve functions.		Level 3 M1 L21–L26 Level 3 M2 L1–L3 Level 3 M2 L9–L12 Level 3 M3 L4–L6 Level 3 M3 L21–L28 Level 4 M3 L4–L6 Level 4 M3 L20 Level 4 M3 L24–L25 Level 4 M3 L29–L31 Level 4 M4 L9 Level 4 M4 L24–L26