

**ER9 Science**

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**Kindergarten**

# Kindergarten Science

## K-12 Science Discipline Questions

1. How do we question, investigate, and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are the structures within a system related to their functions?
4. What are the roles of matter and energy within a system?
5. What is the responsibility of a scientifically literate individual?

## Course Level Questions

1. How does the structure of matter affect the properties and uses of materials?  
(3,1,4,2,5)
2. What processes are responsible for life's unity and diversity? (2,1,3)
3. How do external and internal sources of energy affect the earth's systems?  
(3,1,2,4,5)
4. What makes objects move the way they do? (4,1,2,3,5)

## Science- Kindergarten

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## Unit Title: Senses/Properties/Tools

Duration of Unit: September, October, November

### Unit Level Questions:

1. What are the five different senses that humans have and what sense organs are associated with each sense? (1)
2. What properties can be observed by using the different senses? (1)
3. What are some simple tests that can be used to describe and sort different objects? (1)

### Unit Objectives:

#### Locate and Recall:

1. **Label** each of the five senses with its associated body part and the kind of information it perceives.
2. **Identify/label** properties of materials such as wood, plastic, metal, cloth or paper, and sort objects by the material from which they are made.

#### Integrate and Interpret:

3. **Use** simple tools and nonstandard units to **estimate** or **predict** properties such as size, heaviness, magnetic attraction and float/sink.
4. **Sort** objects by their observable properties.

#### Critique and Evaluate:

5. **Make** scientific observations using the senses, and **distinguish** between an object's observable properties and its name or its uses.
6. **Classify** organisms or objects by one and two observable properties and explain the rule used for sorting (e.g., size, color, shape, texture or flexibility).

**Core Vocabulary** – senses, observe, observation, property, sort, magnetic, non-magnetic, attract, repel, sink, float, flexible, heavy,

### Activities and Resources –

K.1.1 – Body diagram matching five senses with associated body part.

K.1.2 – Observing apples using the sense of sight. (How can I find my apple?)

K.1.3 – Comparison/sorting apples using similarities and differences.

K.1.4 – Does it sink or float?

K.1.4 – Does it attract or repel?

K.1.5 – Properties of materials. (sort items by the material they're made of)

K.1.2 – Observing pumpkins using the sense of sight. (How can I find my pumpkin?)

K.1.3 – Comparing pumpkins using similarities and differences.

K.1.4 – Using simple tools to predict heaviness. (Which items are lighter than a cube?)

K.1.3 – Observing leaves using the sense of sight. (How can I find my leaf?)

K.1.3 – Comparison/sorting leaves using similarities and differences.

K.1.3 – Classify organisms – sort of natural items

K.3.1 and K.3.2 Graphing observations of weather

**Books** - The Five Senses, Apples and Pumpkins, From Seed to Plant, Leaves, Scarecrows

**Tests and Assessments** – Rubrics, Oral explanation, Visual observation

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### **Unit Title: Weather**

Duration of Unit: September - June

### Unit Level Questions:

1. How do the changes in the weather affect living organisms? (3)
2. What are the various forms of precipitation, and when is each type most likely to occur? (3)
3. What are the names of the seasons, and their characteristics, as they exist in New England? (3)
4. What are the various forms of precipitation, and when each type is most likely? (3)
5. What is wind and how can we measure/observe different speeds of wind? (3)

### Unit Objectives:

#### Locate and Recall:

1. Use the senses to **observe** daily weather conditions and **record** data systemically using organizers such as tables, charts, picture graphs or calendars.
2. **Identify** weather patterns and make comparisons and predictions.
3. **Observe** cloud shapes, sizes and colors, and relate the appearance of clouds to fair weather or precipitation.
4. **Write, speak or draw** ways that weather influences humans, other animals and plants.

#### Integrate and Interpret:

5. **Compare** and **predict** weather over time (during the day, from day to day, and from season to season)
6. **Compare and contrast** cloud shapes, sizes and colors, and relate the appearance of clouds to fair weather or precipitation.

#### Critique and Evaluate:

7. **Analyze** weather data collected over time (during the day, from day to day, and from season to season) to identify patterns and make comparisons and predictions.
8. **Make judgments** about appropriate clothing and activities based on weather conditions.

**Core Vocabulary** – weather, precipitation, thermometer, freezing, melt, fall/autumn, winter, spring, summer, season

### **Activities and Resources** -

K.3.3 - Daily Graphing of the weather during morning meeting.

K.3.2 - Identify the various forms of precipitation, and when each type is most likely.

K.3.4 - Dressing the “Weather Bear”, students discuss how they dressed for the weather,

K.3.3 –Enter weather data in simple charts/graphs/diagrams/pictorial

K.3.2 - Using a thermometer to record changes in temperature.

K.3.5 - Describe ways that changes in the weather effect living organisms

K.3.8 - Wind is moving air, moving fast and slow. Can name things that move in the wind (i.e. flags, kites, tree branches)

K.3.7 - Clouds and fog are made of tiny drops of water

K.3.1 - Increase of sun/heat/light causes warming of the air/land/water.

### **Tests and Assessments** – rubric, graphs, calendar recording, Venn diagram

**Books** - The Reason for the Seasons, Books based around the 4 Seasons, Animals in winter, The Snowy Day, Winter

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## Unit Title: **Living vs. non-living things**

Duration of Unit: January, April, May, June

### Unit Level Questions:

1. What are the certain characteristics that distinguish living things from non-living things? (2)
2. How do living things made to get what they need? (2)
3. How do scientists group plants and animals? (2)

### Unit Objectives:

#### Locate and Recall:

1. **Observe** and **describe** differences between living and nonliving things in terms of growth, offspring and need from "food".
2. **Sort** and **count** living and nonliving things in the classroom, the schoolyard and in pictures.
3. **Observe** and write, speak or draw about similarities and differences between plants and animals.
4. **Label** pictures or models of adults with their offspring (animals and plants).

#### Integrate and Interpret:

5. Use nonstandard measures to estimate and **compare** the height, length or weight of different kinds of plants and animals.

#### Critique and Evaluate:

6. **Classify** living and nonliving things in the classroom, the schoolyard and in pictures.
7. **Classify** varied individuals of the same species by one and two attributes (e.g., rabbits or cats with different fur colors; rabbits or dogs with upright or floppy ears, etc.)

Core Vocabulary – classify, reproduction, offspring, characteristics, reptile, insect, mammal

### Activities and Resources –

K.3.5 - Describe ways that changes in the weather effect living organisms.

K.2.2 – Name observable characteristics common to living things and how they relate to growth.

K.2.5 – Know and identify the characteristics of a plant-root, stem, leaves and flower.

K.2.5 – Know and identify the characteristics of an animal-body parts and body coverings.

K.2.5 – Compare characteristics of living things.

K.2.8 – Plants can be grouped based on similarities in appearance of their leaves, stems, blossoms or fruits-grasses, vegetables, flower plants and trees.

Classify things based on living, were once alive, or never alive.

Compare movement in living and non-living things.

Describe and compare how people and animals adapt to the changes of the seasons.

Observe and describe the interactions of animals with their surroundings. (Hibernation).

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### Unit Title: Forces and Motion

Duration of Unit: February, March

### Unit Level Questions:

1. How can an objects position be described in relation to another object or the background? (4)
2. How can an objects motion be described? (4)
3. What are different ways that things can move? (4)
4. Why are force and push and pull, important for motion? (4)
5. How are shadows produced? (4)

### Unit Objectives:

#### Locate and Recall:

1. **Observe, record and predict** the sun's position at different times of day (morning, noon, afternoon or night).

#### Integrate and Interpret:

2. **Compare and contrast** the relative positions of objects using words (in front of, behind, next to, inside of, above or below) and numbers (by measuring its distance from another object).
3. **Apply** direct and indirect pushes and pulls to cause objects to move (change position) in different ways (e.g., straight line, forward and backward, zigzag, in a circle)

#### Critique and Evaluate:

4. Conduct simple experiments and **evaluate** different ways to change the speed and direction of an object's motion.
5. Conduct simple investigations of shadows and **analyze** how shadows change as the relative position of the sun (or an artificial light source) changes.

Core Vocabulary – position, motion, shadow, push, pull, force

### Activities and Resources -

K.1.1.1 - Describe an object's position by comparing it to the position of another stationary object-*in front of, behind, next to, inside of, above or below.*

K.1.1.1.2 - Describe the sun's position in the day time sky relative to stationary objects on earth.

- K.1.1.1.3 - Description of an object's position from different observers might be different, depending on their location.
- K.1.1.1.4 - Using positional words, when the observer moves, the observer will describe changes in an object's position.
- K.1.1.2.3 - Observe that a light source, shining on an object may cast a shadow and that by changing the position the shadow changes (length of shadow).
- K.1.1.1.6 - Name the position of an object using words, numbers labeled diagrams
- K.1.1.1.5 - An object viewed from close up appears to be larger than it does when viewed from far away
- K.1.1.2.1 - How do things move-spin, roll, slide, bounce, fly, or sail
- K.1.1.2.2 -The sun appears to be moving across the sky (but it's the position of the sun that's changing)
- K.1.1.2.4 - Understands that a "push" or "pull" is called a force.
- K.1.1.2.5 - Ways to cause motion-direct contact, moving air, magnetic, gravity pulling it down.
- K.1.1.2.6 - Pushes and pulls can start motion, stop motion or change the speed or direction of an object.

**ER9 Science**

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**Grade 1**

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## Course Level Questions:

1. How are organisms structured to ensure efficiency and survival? (1,2,3,5)
2. How do science and technology affect the quality of our lives? (1,2,5)

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## Unit Title: Life Cycles

Duration of Unit: 6 weeks

## Unit Level Questions:

1. How do animals/insects change in structure and function throughout their life cycle? (1)
2. What is the process of metamorphosis? (1)
3. How are the life cycle stages of different organisms (humans, insects, amphibians) alike and different? (1)
4. How do animals/insects differ in the ways that they acquire air, food, and water to survive? (1)

## Unit Objectives:

### Locate and Recall:

1. **Draw and label** the lifecycle of a butterfly.
2. **Identify** structures and behaviors used by mammals, birds, amphibians, reptiles, fish, and insects to move around, breathe and obtain food and water (e.g., legs/wings/fins, gills/lungs, claws/fingers, etc.)

### Integrate and Interpret:

3. **Discuss** that living things experience a lifecycle that includes birth, growth, reproduction, and death.
4. **Compare and contrast** the changes in structure and behavior that occur during the lifecycles of animals that undergo metamorphosis with those that do not.
5. **Explore** recorded observations to compare the metamorphosis stages of different animals and make predictions based on observed patterns.

### Critique and Evaluate:

6. **Distinguish** between animals that are born alive and those that hatch from eggs.
7. **Evaluate** from direct observation and print or electronic information that most animals and plants need water, food, and air to stay alive.

### Integrated Technology:

- Journey North-A Global Study of Migration  
[www.learner.org/jnorth](http://www.learner.org/jnorth)

### **Assured Experiences/Tasks:**

- Raising live specimen from egg/larva through adulthood. Observing and recording in science journal throughout the life cycle. Butterflies released to continue their migration to Mexico
- OPTIONAL-Tag and track the butterflies migration through [www.learner.org/jnorth](http://www.learner.org/jnorth)

### **Performance Assessment:**

#### ***Butterfly Assessment***

Student will be able to:

- order the pictures of a butterfly life cycle
- label each picture to identify the stage using the language egg, larva, pupa, and adult
- describe and explain in their own words the changes that a butterfly goes through using correct vocabulary

#### ***Frog Assessment***

- order the pictures of a frog life cycle
- label each picture to identify the stage using the language egg, tadpole, froglet, frog
- describe and explain in their own words the changes that a frog goes through using correct vocabulary

#### ***Unit Assessment***

- identify an animal from a live birth and an egg birth
- describe and explain in their own words the difference

### **Core Vocabulary:**

energy, breathe, lungs, gills, absorb, life cycle, egg, metamorphosis, structures (body parts), amphibian, tadpole, insect, caterpillar, chrysalis, larva, pupa, adult, froglet, frog, butterfly

### **Activities and Resources:**

[www.butterflybushes.com](http://www.butterflybushes.com)

*A Butterfly is Born*-Melvin Berger

*From Egg to Butterfly*

*Where Does a Butterfly Go When It Rains?*

*The Very Hungry Caterpillar*, Eric Carle

*Gotta Go*

*Waiting for Wings*

*Munch! Munch! Munch!*

*Charlie the Caterpillar*

*The Caterpillar and the Polliwog*

*I Wish I Were a Butterfly*

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- 

## **Unit Title: Plant lifecycle (Journey North) and Measurement**

Duration of Unit: October-May

## **Unit Level Questions:**

1. How measurement units are (standard and nonstandard) used to analyze growth and changes in a plant? (2)
2. What tools can be used to measure, describe and compare different objects and organisms? (2)
3. How can your observations be accurately expressed in words, pictures, and/or numbers? (2)
4. How do plants use air, water, and sunlight to survive? (1)
5. How do fictional plants/animals differ from non-fiction? (1)

## **Unit Objectives:**

### **Locate and Recall:**

1. Use senses and simple measuring tools to measure the effects of water and sunlight on plant growth.

### **Integrate and Interpret:**

2. **Sort and classify** plants (or plant parts) by observable characteristics (e.g., leaf shape/size, stem, or trunk covering, flower or fruit)
3. **Compare and contrast** information about animals and plants found in fiction and non-fiction sources.

### **Critique and Evaluate:**

4. **Evaluate** from direct observation and print or electronic information that most animals and plants need water, food, and air to stay alive.

### **Integrated Technology:**

- Journey North-A Global Study of Seasonal Changes [www.learner.org/jnorth](http://www.learner.org/jnorth)
- Square of Life-The Center for Innovation in Engineering and Science Education <http://www.ciase.org/curriculum/squareproj/>

**Performance Assessment:**

*Tulip Notebook*

Student will be able to:

- accurately measure using standard and nonstandard units
- draw a detailed diagram with labels
- at the conclusion, they in reflect in writing on their learning

**Core Vocabulary:**

centimeter, meter, gram, kilogram, milliliter, liter, graduated cylinder, thermometer, Celsius, Fahrenheit, organism, plant, animal,

**Activities and Resources:**

Journey North Projects-Tulip Gardens and other experiments/activities

[www.learner.org/jnorth](http://www.learner.org/jnorth)

The Tiny Seed

A Tulip Named Henry

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## Course Level Questions:

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- 

## Unit Title: Shelters

Duration of Unit: 5 weeks

## Unit Level Questions:

1. Why do people need shelters to keep warm or cold, dry and safe? (1,2)
2. Why do climates affect the type of shelter that is needed to survive? (2)
3. What materials are appropriate for shelters in different climates? (2)
4. What characteristics do shelters have in common? (2)
5. How are animal shelters and human shelters similar and different? (1,2)

## Unit Objectives:

### Locate and Recall:

1. **Identify** materials used to build shelters by people in different regions of the world.

### Integrate and Interpret:

2. **Investigate** in books, magazines, and pictures, shelters in different regions of the world.
3. **Conduct** simple tests to compare the properties of different materials and their usefulness for making roofs, windows, walls, or floors (waterproof, transparent, strong)
4. **Compare and contrast** materials used by humans and animals to build shelters.

### Critique and Evaluate:

5. **Support** the reasons for choosing the materials you did to build a shelter in your climate.

## Performance Assessment:

### *Shelter Project Assessment*

Student will be able to:

- design their own shelters using the proper materials based on the climate/environment they choose
- write and describe the reasons they chose their materials and how they are appropriate for their climate/environment

### Shelter Rubric

<b>Knowledge of Human Shelters</b>	Drawing and information accurately describes human shelter	Drawing or information describes shelter	Drawing nor information accurately describes shelter
<b>Knowledge of Construction Materials</b>	Information accurately describes and explains why certain materials were used.	Information accurately describes materials used.	Information does not accurately describe nor explain why certain materials were used.
<b>Mechanics</b>	Correct capitalization, letter formation and punctuation are used throughout.	Correct capitalization, letter formation and punctuation are often used.	Correct capitalization, letter formation and punctuation are sometimes used.

#### Core Vocabulary:

Shelter, rigid, transparent, climate, materials, regions, properties, environment

#### Activities and Resources:

*Charlie Needs a Cloak*

*A Habitat is a Home*

*Animal Homes*

*A House for Hermit Crab*

*Homes Across America*

**ER9 Science**

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**Grade 2**

# Grade 2 Science

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## Course Level Questions

1. How does the structure of matter affect the properties and uses of materials?  
(1, 2, 3, 4)
2. How are organisms structured to ensure efficiency and survival? (1, 2, 4, 5)
3. How do materials cycle through the Earth's systems? (1, 2, 3, 4, 5)
4. How do science and technology affect the quality of our lives? (1, 2, 3, 4, 5)

## Grade 2 Science

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  4. How do science and technology affect the quality of our lives? (1, 2, 3, 4, 5)
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## **Unit 1: What is a Scientist, and what do they do?**

**Duration of Unit: 4 weeks**

### **Unit Questions:**

1. What are the characteristics of a scientist and their actions? (4)

### **Unit Objectives:**

#### **Locate and Recall:**

1. **Describe and illustrate** the characteristics of a scientist and their actions (e.g. observe, measure, predict, wonder, compare, contrast, make conclusions, etc.)
2. **List** the 5 senses scientists use to observe the world around them.
3. **Observe, illustrate, and describe** a variety of objects in their science notebooks

#### **Integrate and Interpret:**

4. **Sort and classify** materials found on a fall walk according to changing categories (e.g. living/non-living, plant-rock, seeds, leaves, rocks)
5. **Compare and Contrast** objects and materials according to their properties and **explain** their criteria
6. **Form predictions** and wondering questions from observations and prior knowledge

#### **Critique and Evaluate:**

7. **Self-assess/Reflect** on the organization, content, and usefulness of their own science notebooks.

### **Common Vocabulary**

Observe, sort, classify, reflect, describe, property, wonder, questions, categories, senses

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## **Unit 2: Properties of Matter**

**Duration of Unit: (12 weeks)**

### **Unit Questions:**

1. What are the unique properties of each state of matter? (1,4)

### **Unit Objectives:**

#### **Locate and Recall:**

1. **List** the properties of solids, liquids, and gases
2. **Observe and Compare** different sizes of solids
3. **Measure, observe, and compare** the volume of a liquid poured into different containers.

#### **Integrate and Interpret:**

4. **Compare and contrast** the properties that distinguish solids, liquids, and gases.
5. **Classify** objects and materials according to their state of matter and **explain** the criteria used.
6. **Design** a fair test to compare the flow rates of different liquids.

#### **Critique and Evaluate:**

7. **Judge** how well another student uses knowledge of science to determine a state of matter and support opinion.

### **Common Vocabulary**

Property, classify, matter, state of matter, solid, liquid, gas, volume, observe, justify, judge, fair test, measure, compare

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## **Unit 3: Nutrition**

Duration of Unit: 8 weeks

### **Unit Questions:**

1. What essential components of balanced nutrition can be obtained from plant and animal sources? (1, 3, 4)
2. How are foods classified into different categories? (1)
3. How do people in other lands get the nutrition they need from different foods? (2, 4)

### **Unit Objectives:**

#### **Locate and Recall:**

1. **Identify** ways people can improve soil quality and crop growth (e.g. irrigation, fertilizer, pest control)

#### **Integrate and Interpret:**

2. **Explain** how food is a source of carbohydrates, protein, and fats.
3. **Classify** foods into groups based on their source, and relate common foods to the plant or animal from which they come.
4. **Describe, compare and contrast** how different cultures meet needs for basic nutrients by consuming various foods.

#### **Critique and Evaluate:**

5. **Evaluate** the nutritional value of different foods by analyzing package labels.

### **Common Vocabulary**

Nutrient, crop, grain, carbohydrate, protein, dairy, fats, oils, energy, classify

## Grade 2 Science

### K-12 Science Discipline Level Questions:

1. How do we question, investigate, and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What are the responsibilities of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 2, 3, 4)
  2. How are organisms structured to ensure efficiency and survival? (1, 2, 4, 5)
  3. How do materials cycle through the Earth's systems? (1, 2, 3, 4, 5)
  4. How do science and technology affect the quality of our lives? (1, 2, 3, 4, 5)
- 

## Unit 4: Properties of Soil

Duration of Unit: 12 weeks

### Unit Questions:

1. How can soils be classified by color, texture, and capacity to retain water? (1, 4)
2. How do soils support the growth of many kinds of plants, including those in our food supply? (2, 3, 4)
3. How do soils vary from place to place? (1, 2, 4)

### Unit Objectives:

#### Locate and Recall:

1. **Identify** soil types by particle size (texture), size, and capacity to retain water and **describe** best uses for soil types
2. **Locate and obtain** soil samples from different sites
3. **Describe** likely soil types from various areas (e.g. beach- sandy, forest- humus, compacted areas- clay)

#### Integrate and Interpret:

4. **Use** senses and simple tools (e.g. sieves and settlement tests) to separate soil into components such as rock fragments, water, air, and plant remains.
5. **Classify** soils by properties such as color, particle size (sand, silt, or clay), or amount of organic material (loam).
6. **Explain** the importance of soil to plants, animals and people.
7. **Investigate** how different soil types affect plant growth and **write conclusions** supported by evidence by **conducting** a fair test.

#### Critique and Evaluate:

8. **Evaluate** the quality of different soil types in terms of observable presence of air, water, living things and plant remains.

### Common Vocabulary

Soil, property, classify, mixture, particle, humus, sand, silt, clay, texture, nutrients, investigate, observe, evaluate, capacity, fair test, sedimentation

## Grade 2 Science

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1. How do we question, investigate, and explain the world around us?
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  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What are the responsibilities of a scientifically literate individual?
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### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 2, 3, 4)
  2. How are organisms structured to ensure efficiency and survival? (1, 2, 4, 5)
  3. How do materials cycle through the Earth's systems? (1, 2, 3, 4, 5)
  4. How do science and technology affect the quality of our lives? (1, 2, 3, 4, 5)
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## Unit 5: Plants

Duration of Unit: 8 weeks

### Unit Questions:

1. What is the life cycle of a flowering plant? (1, 2, 3, 4)
2. How do environmental conditions, such as temperature, amount of light, amount of water and type of soil, affect seed germination and plant development? (3)

### Unit Objectives:

#### Locate and Recall:

1. **Use** senses and simple tools to observe and describe the roots, stems, leaves, flowers and seeds of various plants (including trees, vegetables and grass.)
2. **Describe** the functions of roots, stems, leaves, flowers and seeds in completing a plant's life cycle.
3. **Record observations** and **make conclusions** about the sequence of stages in a flowering plant's life cycle.

#### Integrate and Interpret:

4. **Compare and contrast** how seeds of different plants are adapted for dispersal by water, wind, or animals.
5. **Explore** factors (e.g. light, soil type, temperature, amount of water) that affect seed germination and plant growth through **conducting** a fair test.

#### Critique and Evaluate:

6. **Determine importance** of environmental factors on plant life cycles.

### Common Vocabulary

Brassica, life cycle, structures (body parts), seed, germinate, reproduce, flower, pollen, pollinator, seed dispersal

**ER9 Science**

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**Grade 3**

# Grade 3 Science

## K-12 Science Discipline Questions

1. How do we question, investigate, and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are the structures within a system related to their functions?
4. What are the roles of matter and energy within systems?
5. What is the responsibility of a scientifically literate individual?

## Course Level Questions

1. How does the structure of matter affect the properties and uses of materials?  
(1, 4)
2. How do the parts of an animal help it adapt and survive in its environment?  
(1, 3)
3. How does the structure of a rock relate to the use of the rock? (1, 3)
4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)

## Grade 3 Science

### K-12 Science Discipline Questions:

1. How do we question, investigate, and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 4)
  2. How do the parts of an animal help it adapt and survive in its environment? (1, 3)
  3. How does the structure of a rock relate to the use of the rock? (1, 3)
  4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)
- 

## Unit #1: What is Science?

Duration of Unit: 10 periods

### Unit Question:

1. What is science and the scientific method? (4)
2. What are the characteristics of a scientist, their actions and the tools they use? (4)

### Unit Objectives:

#### Locate and Recall

1. **Describe and illustrate** the characteristics of a scientist and their actions (e.g. observe, measure, predict, wonder, compare, contrast, make conclusions, etc.).
2. **Observe, illustrate, and describe** a variety of objects in their science notebooks.
3. **Identify** tools of a scientist and how to utilize them.
4. **Organize** student science notebook content.

#### Integrate/Interpret

5. **Investigate** scientific phenomena (mentos, pencil in water-filled baggie, rainbow milk).
6. **Explore** and **formulate** the steps of the scientific method.

#### Critique/Evaluate

7. **Self-assess/reflect** on the organization, content, and usefulness of their own science notebooks through the use of science rubric.

#### Vocabulary:

Inquiry, scientist, hand lens, microscope, beaker, goggles, slide, phenomenon, science notebook, observe, focus question, predict/ hypothesis, conclusion, data

#### Activities/Assessments:

Scientist slideshow, drawing of scientist, science poem, create a testable question, bag of water with pencil, set-up science notebooks, demonstration of phenomena

## Grade 3 Science

### K-12 Science Discipline Questions:

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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 4)
  2. How do the parts of an animal help it adapt and survive in its environment? (1, 3)
  3. How does the structure of a rock relate to the use of the rock? (1, 3)
  4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)
- 

## Unit #2: Properties of Matter

**Duration of Unit:** 20 periods

### Unit Question:

1. What are the properties and uses of solids, liquids and gases? (1)

### Unit Objectives:

#### Locate/Recall

1. **Define** a solid, liquid, and a gas.
2. **Show** and **demonstrate** if solids sink and/or float.

#### Integrate/Interpret

3. **Sort** materials based on properties.

#### Critique/Evaluate

4. **Make** a plan for an experiment to test material as heat conductors and/or absorbers.
5. **Graph** results from the experiment.

### Vocabulary:

States of Matter (solid, liquid, gas) dissolve, absorb, conduct, attract, melt, freeze, boil, evaporate, and condense

### Activities/Assessments:

United Streaming/Safari Montage/BrainPop videos, dissolving sugar, float or sink activity, testing insulators, magnet attraction, Oobleck mixture, temperature affecting flow of ketchup in packets

## Grade 3 Science

### K-12 Science Discipline Questions:

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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 4)
  2. How do the parts of an animal help it adapt and survive in its environment? (1, 3)
  3. How does the structure of a rock relate to the use of the rock? (1, 3)
  4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)
- 

## Unit #3: Animal Adaptations (Heredity and Evolution)

Duration of Unit: 20 periods

### Unit Question:

1. How does a \_\_\_\_\_ adaptations help it to find food, move, and protect itself in its habitat? (2)

### Unit Objectives:

#### Locate/Recall

1. **Demonstrate** how animals use camouflage to protect themselves.
2. **Identify** how certain behaviors (hibernation, migration) help animals in difficult conditions.

#### Integrate/Interpret

3. **Compare** and **contrast** features and behaviors that enable different animals to survive in their habitat.

#### Critique/Evaluate

4. **Decide** whether a chosen adaptation helps a plant or animal to survive in their habitat and **construct** a model of it.

### Vocabulary:

Adaptation, camouflage, hibernations, migration, locomotion, structure, environment, habitat, predator, prey

### Activities/Assessments:

United Streaming/Safari Montage/BrainPop videos, model/diagram of animal, animal brochure or passport, Audubon Society in-school trip

## Grade 3 Science

### K-12 Science Discipline Questions:

1. How do we question, investigate, and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 4)
  2. How do the parts of an animal help it adapt and survive in its environment? (1, 3)
  3. How does the structure of a rock relate to the use of the rock? (1, 3)
  4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)
- 

## Unit #4: Rocks and Minerals (The Changing Earth)

Duration of Unit: 20 periods

### Unit Questions:

1. Which properties do rocks and minerals have that may be identified through observation and testing? (3)
2. How do properties of rocks and minerals determine the use of the material? (3)

### Unit Objectives:

#### Locate/Recall

1. **Observe** and **determine** properties of different types of rocks

#### Integrate/Interpret

2. **Investigate** properties of different rocks (size, hardness, magnetic properties, color, texture, luster)
3. **Summarize** how igneous, metamorphic, and sedimentary rocks are formed

#### Critique/Evaluate

4. **Evaluate** the usefulness of different rock types for specific applications (buildings, sidewalks, monuments, writing utensils)

### Vocabulary:

Property, classify, igneous, sedimentary, metamorphic, fossil, crystal, mineral, texture, luster, hardness, magnetism

### Activities/Assessments:

United Streaming/Safari Montage/BrainPop videos, sorting rocks according to properties, mock rocks, rock cycle song, Peabody Museum field trip, testing rocks, make a pet rock

## Grade 3 Science

### K-12 Science Discipline Questions:

1. How do we question, investigate, and explain the world around us?
  2. How does science impact us and the rest of the universe?
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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How does the structure of matter affect the properties and uses of materials? (1, 4)
  2. How do the parts of an animal help it adapt and survive in its environment? (1, 3)
  3. How does the structure of a rock relate to the use of the rock? (1, 3)
  4. How do we use science to help ourselves and protect our environment? (1, 2, 3, 5)
- 

## Unit #5: Conservation (Science and Technology in Society)

Duration of Unit: 20 periods

### Unit Question:

1. How can earth materials be conserved? (4)

### Unit Objectives:

#### Locate/Recall

1. **Describe** ways people use earth materials, such as fossil fuels (oil, gas), bio-fuels (ethanol, plant, grass, trees) water, soils, and rocks as natural resources to improve their lives
2. **List** ways people use renewable energy sources (solar, wind, water power) to improve their lives

#### Integrate/Interpret

3. **Estimate, measure** and **graph** the quantity of a natural resource used during a certain time period

#### Critique/Evaluate

4. **Distinguish** among reducing use, reusing, recycling, and replacing as conservation techniques
5. **Choose** the best material for insulating (keeping a substance hot/cold)

### Vocabulary:

Natural resources, recycle, reduce, reuse, landfills

### Activities/Assessments:

United Streaming/Safari Montage/BrainPop videos, soggy paper, discuss conservation and natural resources, visit a recycling plant, recyclable-made crafts

# **ER9 Science**

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## **Grade 4**

# Science – Grade 4

## K-12 Science Discipline Questions

1. How do we explore, investigate and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are the structures within a system related to their functions?
4. What are the roles of matter and energy within systems?
5. What is the responsibility of a scientifically literate individual?

## Course Level Questions

1. How do matter and energy flow through ecosystems? (1,2,3)
2. How do external & internal energy sources affect the earth's systems.  
(1,3,4)
3. What makes objects move the way they do? (1,3,4)
4. What is the role of energy in our world? (1,2,5)

## Science – Grade 4

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How do matter and energy flow through ecosystems? (1,2,3)
  2. How do external & internal energy sources affect the earth's systems. (1,3,4)
  3. What makes objects move the way they do? (1,3,4)
  4. What is the role of energy in our world? (1,2,5)
- 

## Unit 1: Interdependence of Living Organisms (CT 4.2)

Duration: 4 weeks

### Unit Questions:

1. How do living and non-living things interact in an ecosystem? (1, 2)
2. How is energy transferred from one organism to another in a food chain? (1,2,4)
3. How does the removal or addition of an organism in a food chain affect the ecosystem? (1,2,4)
4. How does the sun impact the ecosystem? (1,4)
5. How does human activity impact an ecosystem? (1,2)

### Unit Objectives

#### Locate and Recall:

1. **Observe** an ecosystem and identify living and non-living objects and record in science notebook. ( food chain)
2. **Group and chart** properties that show differences from a non-living and living object. (food chain)
3. **Identify** the producers, consumers, herbivores, carnivores, omnivores, and decomposers in a food chain. (food chain)

#### Integrate & Interpret:

4. **Construct** a Bio-Bottle to create a mini-ecosystem to explore the interdependence of non-living and living objects. (bio-bottle project)
5. **Observe and draw a diagram** to show and explain changes in the bio-bottle on a weekly basis. (bio-bottle project)
6. **Draw a diagram to explain** the flow of energy among the organisms in a food chain. (food chain)

#### Critique and Evaluate:

7. **Analyze and determine importance** of having both non-living and living objects in an ecosystem. (food chain/bio-bottle project)
8. **Assess** the impact on an ecosystem with the removal or extinction of an animal or plant. (food chain/bio-bottle)
9. **Analyze** the impact of natural phenomena and human activity on habitats and their inhabitants.

## Science – Grade 4

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
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### Course Level Questions:

1. How do matter and energy flow through ecosystems? (1,2,3)
  2. How do external & internal energy sources affect the earth's systems. (1,3,4)
  3. What makes objects move the way they do? (1,3,4)
  4. What is the role of energy in our world? (1,2,5)
- 

## Unit 2: Water Cycle/Erosion (CT 4.3)

Duration: 2 weeks

### Unit Questions:

1. How does the sun's energy impact the water cycle?(1, 2,4)
2. How does water impact erosion and river formation? (1,2,4)
3. How does the heating and cooling of the earth's atmosphere create a continuous cycle of water? (1,2,4)

### Unit Objectives:

#### Locate and Recall:

1. **Draw** and label the continuous cycle of water (evaporation, condensation and precipitation) that occurs in the atmosphere.
2. **Identify and label** the role of heating and cooling the atmosphere that creates each part of the water cycle.
3. **Observe** bio-bottles to find evidence of water cycle.

#### Integrate & Interpret:

4. **Construct a model** to represent the water cycle.
5. **Investigate** the causes of evaporation and condensation in the water cycle.
6. **Investigate** how moving water causes changes to land surfaces.

#### Critique and Evaluate:

7. **Analyze and judge** the best way to decrease erosion.
8. **Analyze and determine importance** of the sun's energy on the water cycle.

## Science – Grade 4

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
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### Course Level Questions:

1. How do matter and energy flow through ecosystems? (1,2,3)
  2. How do external & internal energy sources affect the earth's systems. (1,3,4)
  3. What makes objects move the way they do? (1,3,4)
  4. What is the role of energy in our world? (1,2,5)
- 

## Unit 3: Forces and Motion (CT 4.1)

**Duration: 3 weeks**

### **Unit Questions:**

1. How does force cause an object to move, stop, or change speed or direction? (3,4)
2. How does an object's mass affect the motion of an object? (1,2,4)
3. How does friction affect the motion of an object? (1,2,4)
4. How does gravity affect the motion of an object? (1,2,4)
5. How does force and motion affect everyday activities? (1,2,4)

### **Unit Objectives:**

#### Locate and Recall:

1. **Identify** different types of force such as pushes and pulls that are used in everyday activities.
2. **Observe** the different forces that are required to move common objects.
3. **Illustrate** the forces used in a common sport or activity

#### Integrate & Interpret:

4. **Investigate** through a planned experiment how friction affects the motion of an object on varying surfaces.
5. **Investigate** how varying the incline affects the motion of the object.
6. **Investigate** how varying the amount of force affects the motion.
7. **Investigate** how varying the amount of mass affects the motion.
8. **Use spring scale/measurement** tools to identify the amount of force necessary to move an object.

#### Critique and Evaluate:

9. **Analyze and determine importance** of the force of friction in an everyday activity.
10. **Assess** the impact of an object in motion without the forces of friction and gravity present.

## Science – Grade 4

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
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### Course Level Questions:

1. How do matter and energy flow through ecosystems? (1,2,3)
  2. How do external & internal energy sources affect the earth's systems. (1,3,4)
  3. What makes objects move the way they do? (1,3,4)
  4. What is the role of energy in our world? (1,2,5)
- 

## Unit 4: Energy Transfer and Transformations (CT 4.4)

Duration: 4 weeks

### Unit Questions:

1. How does electricity flow in a circuit to transform into light, heat, sound and magnetic effects? (4)
2. How do batteries and wires transfer energy to a light bulb? (4)
3. How can simple electrical circuits be used to determine which materials conduct electricity? (4)
4. How does the force of magnets cause an object to move without direct contact between the object and magnet?

### Unit Objectives:

#### Locate and Recall:

1. **Arrange** the wire, battery and light bulb in different ways in order to light the bulb. (electricity)
2. **Observe and illustrate** the different ways that lit the bulb. (electricity)
3. **Arrange** the five donut magnets on a pencil so they all attract. (magnets)
4. **Observe and illustrate** the different combinations of attracting and repelling magnets. (magnets)

#### Integrate & Interpret:

5. **Analyze** illustrations **and distinguish** between an open and closed electrical circuit. (electricity)
6. **Predict** materials that will act as conductors or insulators of electricity. (electricity)
7. **Investigate** using a simple electrical circuit, materials that are conductors or insulators of electricity. (electricity)
8. **Design** a testable experiment to apply their knowledge of the scientific method and electrical circuits. (electricity)
9. **Analyze** illustrations **and distinguish** between the force of attraction and repelling. (magnets)
10. **Predict** materials that will attract to magnet and those that will repel magnet. (magnets)
11. **Summarize** what you have learned about how magnetic forces work. Use evidence to support thinking. (magnets)

12. **Design** a testable experiment to apply their knowledge of the scientific method and magnetic forces. (magnets)

**Critique and Evaluate:**

13. **Analyze and determine** illustrations that will complete a closed circuit.

**ER9 Science**

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**Grade 5**

# Grade 5 Science

## K-12 Science Discipline Questions

1. How do we explore, investigate and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are the structures within a system related to their functions?
4. What are the roles of matter and energy within systems?
5. What is the responsibility of a scientifically literate individual?

## **Course Level Questions:**

1. How is scientific knowledge created and communicated? (1)
2. What is the role of energy in our world? (4)
3. How are organisms structured to ensure efficiency and survival? (3)
4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
5. How do science and technology affect the quality of our lives? (1, 2, 4, 5)

# Grade 5 Science

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their function?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. What is the role of energy in our world? (4)
  3. How are organisms structured to ensure efficiency and survival? (3)
  4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
  5. How do science and technology affect the quality of our lives? (1, 2, 4, 5)
- 

## **Unit 1: Scientific Method/Inquiry**

**Length of Unit: 4 Weeks**

### **Unit Questions:**

1. How do scientists conduct investigations using the scientific method? (1)
2. How do scientists compile and communicate information? (1)

### **Unit Objectives:**

#### Locate and Recall:

1. **Define** the steps of the scientific method.
2. **Observe** and ask questions about objects, organisms and the environment.
3. **Seek** relevant information in books, magazines and electronic media.
4. **Use** measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials
5. **Use** simple equipment and measuring tools to gather data and extend the senses.
6. **Read** a variety of science-related fiction and nonfiction texts.
7. **Search** the Web and **locate** relevant science information

#### Integrate and Interpret:

8. **Design** and conduct simple investigations.
9. **Use** data to **construct** reasonable explanations.

#### Critique and Evaluate:

10. **Use** mathematics to **analyze**, **interpret** and **present** data.
11. **Analyze**, **critique** and **communicate** investigations using words, graphs and drawings.

### Vocabulary

observation, hypothesis, experiment, variable, data, conclusion, analyze, results, diagram, model, reflection

## Grade 5 Science

### K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
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  3. How are the structures within a system related to their function?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. What is the role of energy in our world? (4)
  3. How are organisms structured to ensure efficiency and survival? (3)
  4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
  5. How do science and technology affect the quality of our lives? (1, 2, 4, 5)
- 

## Unit 2: Earth, Moon, and Sun

Length of Unit: 6 Weeks

### **Unit Questions:**

1. How do the movements of the earth and moon explain the cycles of day and night and the monthly moon phases? (4)
2. What role does the light from the sun play in the cycles of day and night and the monthly moon phases? (2,4)

### **Unit Objectives:**

#### Locate and Recall:

1. **Observe and record** the moon's appearance over time.

#### Integrate and Interpret:

2. **Construct** models demonstrating Earth's rotation on its axis, the moon's revolution around the earth, and the earth and moon revolving around the sun.
3. **Explain** the motion of the earth relative to the sun that causes Earth to experience cycles of day and night.
4. **Distinguish** between the sun as a source of light and the moon as a reflection of that light.
5. **Relate** the moon phases to changes in the moon's position relative to the earth and sun during its 29-day revolution around the earth.

#### Critique and Evaluate:

6. **Analyze** moon observations to describe the cyclical changes in its appearance from Earth (moon phases).

### Vocabulary

sphere, illuminate, reflect, rotate, day/night cycle (24-hour rotation period), horizon, orbit, revolve, month (one lunar cycle), moon phase, new moon, axis, orbit, waxing, waning

## Grade 5 Science

### K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
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### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. What is the role of energy in our world? (4)
  3. How are organisms structured to ensure efficiency and survival? (3)
  4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
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- 

## Unit 3: Brain and Nervous System

Length of Unit: 7 Weeks

### Unit Questions:

1. How are sense organs structured in order to gather information from the environment? (3)
2. How do the sense organs perceive stimuli? (3)
3. How is information transmitted, interpreted and responded to by the nervous system? (3)

### Unit Objectives:

#### Locate and Recall:

1. **Identify** the major structures of the human eye, ear, nose, skin and tongue, and explain their functions.
2. **Conduct** simple tests to explore the capabilities of the human senses.

#### Integrate and Interpret:

3. **Explain** the role of sensory organs in perceiving stimuli (e.g., light/dark, heat/cold, flavors, pain, etc.)
4. **Pose** testable questions and design experiments to determine factors that affect human reaction time.
5. **Use** diagrams to understand the different parts of the nervous system and their relationships.
6. **Summarize** nonfiction text to explain the role of the brain and spinal cord in responding to information received from the sense organs.
7. **Use** diagrams to understand the different parts of the nervous system and their relationships.

#### Critique and Evaluate:

8. **Analyze** results of experiments on reaction time.

### Vocabulary

sense organ, receptor, stimulus, response, nervous system, spinal cord, reaction time

## Grade 5 Science

### K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their function?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. What is the role of energy in our world? (4)
  3. How are organisms structured to ensure efficiency and survival? (3)
  4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
  5. How do science and technology affect the quality of our lives? (1, 2, 4, 5)
- 

## Unit 4: Sound

Length of Unit: 6 Weeks

### Unit Questions:

1. How is sound produced and transmitted? (2)
2. What are the characteristics of sound and how can they be changed? (2)
3. How does the human ear perceive sound? (3)

### Unit Objectives:

#### Locate and Recall

1. **Demonstrate** how the loudness, pitch and quality/timbre of sound can be varied.
2. **Describe** the properties of materials that reflect or absorb sound.
3. **Identify** the major structures of the human ear and explain their functions.

#### Integrate and Interpret

4. **Generalize** that vibrating objects produce sound if the vibrations are transferred from the object through another material (e.g., air, a solid, or a liquid).
5. **Design and conduct** investigations to determine factors that affect pitch.
6. **Construct** simple musical instruments (e.g., rubber band guitars, drums, etc.) that produce sounds with various pitches, volume and timbres.

#### Critique and Evaluate

7. **Analyze** properties of materials that cause sound to be reflected or absorbed, then **apply** findings to design a device that reflects or absorbs sound.

### Vocabulary

vibration, transmit, reflect, absorb, volume, pitch, frequency

## Grade 5 Science

### K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their function?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. What is the role of energy in our world? (4)
  3. How are organisms structured to ensure efficiency and survival? (3)
  4. How does the position of Earth in the solar system affect conditions on our planet? (1, 2, 4)
  5. How do science and technology affect the quality of our lives? (1, 2, 4, 5)
- 

## Unit 5: Light

### Length of Unit: 9 Weeks

### Unit Questions:

1. What is light and what is it composed of? (2)
2. How does light travel and interact with objects? (2)
3. How does the human eye perceive light and color? (2, 3)
4. What tools have been created that change the path of light and how do they function? (2, 5)

### Unit Objectives:

#### Locate and Recall

1. **Measure** angles to demonstrate the path of light reflected by a mirror.
2. **Determine** whether a material is opaque, transparent or translucent based on how light passes through it.
3. **Draw** diagrams showing the straight path of light rays from a source to a reflecting object to the eye, allowing objects to be seen.
4. **Describe** the properties of different materials and the structures in the human eye that enable humans to perceive color.
5. **Identify** the major structures of the human eye explain their functions.

#### Integrate and Interpret

6. **Provide** evidence that light travels in straight lines away from a source in all directions.
7. **Investigate** how light is refracted as it passes through a lens or through one transparent material to another.
8. **Demonstrate** that white light is composed of many colors.
9. **Explain** that all visible objects are reflecting some light to the human eye.
10. **Contrast** the way light is reflected by a smooth, shiny object (e.g., mirror or pool of water) and how light is reflected by other objects.
11. **Design and conduct** light absorption experiments that vary the size, length, direction and clarity of a shadow by changing the position of the light-blocking object or the light source.
12. **Generalize** that optical tools, such as binoculars, telescopes, eyeglasses or periscopes, change the path of light by reflecting or refracting it.
13. **Construct** simple periscopes and telescopes, and analyze how the placement of their lenses and mirrors affects the quality of the image formed.

14. **Design** and **conduct** simple investigations to determine how the shape of a lens or mirror (concave, convex, flat) affects the direction in which light rays travel.
15. **Explain** how eyeglasses or contact lenses improve vision by changing the path of light to the retina.

### **Critique and Evaluate**

16. **Evaluate** the best optical instrument to perform a given task.
17. **Analyze** the similarities and differences between structures of the human eye and those of a simple camera.

### **Vocabulary**

reflect, refract, absorb, cornea, pupil, iris, lens, retina, prism, white light, , transparent, translucent, opaque, angle , transfer, transmit, optical tool, hand lens, magnifying glass, telescope, periscope, microscope, binoculars, lens, mirror, concave, convex, refract, focus, eyelid, lens cap, lens opening, film (or digital medium)

## **ER9 Science**

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### **Earth Science – Grade 6**

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are structures within a system related to their functions?
4. What are the roles of matter and energy within systems?
5. What is the responsibility of a scientifically literate individual?

## Course Level Questions

1. How do we question, investigate and explain the Earth and the Universe? (1)
2. How does Earth Science impact us and the rest of the world? (2)
3. How are the structures within the Earth's systems related to their functions? (3)
4. What are the roles of matter and energy within Earth's systems? (4)
5. What is the responsibility of scientifically literate individuals' impact on their environment? (5)

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions

1. How do we question, investigate and explain the Earth and the Universe? (1)
  2. How does Earth Science impact us and the rest of the world? (2)
  3. How are the structures within the Earth's systems related to their functions?(3)
  4. What are the roles of matter and energy within Earth's systems?(4)
  5. What is the responsibility of scientifically literate individuals' impact on their environment? (5)
- 

## Unit 1: Nature of Science

Duration of Unit: 5 Weeks

### Unit Questions:

1. How do the steps of the scientific method help us to explain the world around us? (1)
2. How can we use scientific information to communicate ideas and explain natural phenomena accurately? (5)

### Unit Objectives:

#### Locate and Recall

1. **Identify and demonstrate** the use of the scientific method through the use of the following: Observation, Question, Hypothesis, Variables, Experimentation, Analysis, Conclusion and Reflection.
2. **Identify** independent and dependent variables and those variables that are kept constant.
3. **Demonstrate** the use of appropriate lab equipment and metric measuring tools safely.
4. Using lab guidelines **complete** a lab report.

#### Integrate and Interpret

5. **Use** mathematical operations to analyze and interpret data.
6. **Provide** explanations to investigated problems or questions.
7. **Defend** conclusions using relevant science vocabulary, supporting evidence and clear logic.
8. **Create** graphs to organize and identify relationships between variables.
9. **Construct** valid testable questions.

#### Critique and Evaluate

10. **Identify** errors that impact that the validity of the experiment.
11. **Reflect** on lab findings as it pertains to the testable question.

### Core Vocabulary:

**Lesson 1-1:** Science, Observation, Inferences, Hypothesis, Prediction, Technology, Scientific Theory, Scientific law, Critical thinking

**Lesson 1-3:** Variable, independent variable, (manipulated variable) dependent variable

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions

1. How do we question, investigate and explain the Earth and the Universe?(1)
  2. How does Earth Science impact us and the rest of the world? (2)
  3. How are the structures within the Earth's systems related to their functions? (3)
  4. What are the roles of matter and energy within Earth's systems? (4)
  5. What is the responsibility of scientifically literate individuals' impact on their environment? (5)
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## Unit 2: Astronomy

Duration of Unit: 7 weeks

### Unit Questions

1. How does gravity affect the structure and interaction of matter in the universe? (1, 3)
2. How does the relative motion and relative position of celestial bodies impact one another? (3,4)

### Unit Objectives:

#### Locate and Recall

1. **Explain** that the universe contains many millions of galaxies, and each galaxy contains billions of stars, with our sun as a medium sized star within the Milky Way Galaxy.
2. **Retell** the formation of the universe through the Big Bang Theory.
3. **Illustrate** the life cycle of a star including our sun.
4. **Study** the speed of light to appreciate distances in the Universe.
5. **Identify** the phenomena produced by the Sun, moon, and Earth.

#### Integrate and Interpret

6. **Describe** the relationship among the bodies in our solar system.
7. **Model** the basic motions of rotation and revolution of the Earth and Moon relative to the sun.
8. **Describe** the cause and effect relationship among the Sun, Earth and Moon (Tides, seasons, length of day, eclipses).
9. **Explore** the composition and structure of stars including nuclear fusion.
10. **Classify** stars by their temperature, color and mass.
11. **Compare** and contrast the characteristics of the three types of galaxies and our place in our Milky Way Galaxy.

#### Critique and Evaluate

12. **Evaluate** how distance and mass have an effect on the gravitational pull of objects.
13. **Assess** how gravity and inertia in our solar system keep objects in a predictable path.

### Core Vocabulary:

**19-1:** electromagnetic spectrum.

**19-2:** satellite,

**20-1:** orbit, revolution, rotation, rotation axis, solstice, equinox.

**20-3:** umbra, penumbra, solar eclipse, lunar eclipse, tide.

**21-1:** asteroid, comet, astronomical unit, period of revolution, period of rotation

**21-2:** terrestrial greenhouse effect.

**21-3:** Galilean moons

**21-4:** meteoroid, meteor, meteorite, impact crater

**22-1:** Spectroscope, astronomical unit., light year, apparent magnitude, luminosity

**22-2:** nuclear fusion, star, radiative zone, convection zone, photosphere, chromosphere, corona, Hertzsprung-Russell diagram

**22-3:** Nebula, White dwarf, supernova, neutron star, black hole

**22-4:** Galaxy, dark matter, Big Bang theory, Doppler shift

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions

1. How do we question, investigate and explain the Earth and the Universe? (1)
  2. How does Earth Science impact us and the rest of the world? (2)
  3. How are the structures within the Earth's systems related to their functions? (3)
  4. What are the roles of matter and energy within Earth's systems? (4)
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- 

## Unit 3: Processes and Forces that Shape the Earth

Duration of Unit: 10 weeks

### Unit Question:

1. How do external and internal sources of energy affect the Earth's physical structure and systems? (3, 4)

### Unit Objectives:

#### Locate and Recall

1. **Illustrate and describe** the 3 major layers of the Earth's interior.
2. **Observe** geological events that have shaped Connecticut's landscape.

#### Integrate and Interpret

3. **Explain** how Earth's internal energy is transferred to move tectonic plates (Theory of Plate Tectonics).
4. **Correlate** common geological features and events (deep sea trenches, mountains, Earthquakes, volcanoes) with the location of plate boundaries.
5. **Describe** how road cuts and barren rock provide proof of folding and faulting of the crust.
6. **Analyze and interpret** data about the location, frequency and intensity of Earthquakes.
7. **Compare and contrast** the major agents of weathering and erosion.
8. **Investigate and determine** how glaciers form and how they change the Earth's surface over time.
9. **Classify** rocks and minerals according to their properties.

#### Critique and Evaluate

10. **Evaluate** the placement of plate boundaries from the locations of earthquakes and volcanoes using classroom resources.
11. **Validate** that the Earth's surface and interior are in constant motion and ever changing.

### Core Vocabulary:

**Lesson 2-2:** crust, mantle, lithosphere, asthenosphere, core, magnetosphere

**Lesson 2-3:** landform, plain, plateau, mountain

**Lesson 3-1:** mineral, silicate, crystallization, magma, lava

**Lesson 3-2:** mineralogist, luster, streak, hardness, cleavage, fracture, density

**Lesson 3-3:** ore, gemstone

**Lesson 4-1:** rock, grain, texture, magma, lava, sediment, rock cycle

**Lesson 4-2:** extrusive igneous, intrusive igneous, volcanic glass

**Lesson 4-3:** compaction, cementation, clastic rock, clast, chemical rock, biochemical rock

**Lesson 4-4:** metamorphism, plastic deformation, foliated rock, nonfoliated rock

**Lesson 5-1:** weathering, mechanical weathering, chemical weathering, oxidation

**Lesson 5-2:** soil, organic matter, pore

**Lesson 6-1:** erosion, deposition, landforms

**Lesson 6-2:** meander, longshore current, delta, abrasion, dune, loess

**Lesson 6-3:** mass wasting, landslide, talus, glacier, till moraine, outwash

**Lesson 7-1:** Pangaea, continental drift

**Lesson 7-2:** mid-ocean ridge, seafloor spreading, magnetic reversal, normal polarity, reverse polarity, oceanic crust, continental crust

**Lesson 7-3:** plate tectonics, lithosphere, divergent boundary, transform boundary, convergent boundary, subduction, convection

**Lesson 8-1:** isostasy, subsidence, uplift, compression, tension, shear, strain

**Lesson 8-2:** ocean trench, volcanic arc, transform fault, fault zone

**Lesson 8-3:** mountain building cycle

**Lesson 8-4:** plains, basin, plateau

**Lesson 9-1:** earthquake, fault, seismic wave, focus, epicenter, primary wave, secondary wave, surface wave, seismologist, seismometer, seismogram

**Lesson 9-2:** volcano, magma, lava, hot spot, shield volcano, composite volcano, volcanic ash, viscosity

**Common Assessment: Mineral lab**

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions

1. How do we question, investigate and explain the Earth and the Universe? (1)
  2. How does Earth Science impact us and the rest of the world? (2)
  3. How are the structures within the Earth's systems related to their functions? (3)
  4. What are the roles of matter and energy within Earth's systems? (4)
  5. What is the responsibility of scientifically literate individuals' impact on their environment? (5)
- 

## Unit 4: Atmosphere and Weather:

Duration of Unit: 9 weeks

### Unit Question:

- 1) How does the variation in the amount of the sun's energy hitting the Earth's surface affect Earth's weather systems? (2,3,4,)

### Unit Objectives:

#### Locate and Recall

1. **Illustrate and recall** the layers of the Earth's atmosphere.
2. **Differentiate** between climate and weather and their impact on Connecticut.
3. **Diagram** the transfer of energy as water changes phase.
4. **Identify** global wind patterns caused by the uneven heating of the Earth and its rotation.

#### Integrate and Interpret

5. **Demonstrate** how changes in temperature, pressure, moisture and density of air affect weather patterns.
6. **Compare** the 3 types of solar heat transfer in the atmosphere and on the surface of the Earth.
7. **Design** and conduct an investigation that reveals different substances absorb and release heat at different rates as it relates to land and sea breezes.
8. **Examine** how the uneven heating of the Earth's surface and differences in air pressure result in local weather patterns.
9. **Forecast** the local weather using a national weather map.

#### Critique and Evaluate

10. **Determine the importance** of the role of the change in heat on the expansion and contraction of molecules.
11. **Reflect** on how global conditions affect our local weather and climate.

### Core Vocabulary:

**12-1:** Atmosphere, water vapor, troposphere, stratosphere, ozone layer, ionosphere.

**12-2:** Radiation, conduction, convection, stability, temperature inversion.

**13-1:** Weather, air pressure, humidity, relative humidity, dew point, precipitation, water cycle

**13-2:** High pressure system, low pressure system, air mass, front, tornado, hurricane, blizzard

**13-3:** Surface Report, upper air report, Doppler radar, Isobar, Computer model

**14-1:** Climate, rain shadow, specific heat, microclimate

**14-2:** Ice age, Interglacial, El nino/Southern oscillation, monsoon, drought

**14-3:** Global warming, greenhouse gas, deforestation, global climate model

# Earth Science - Grade 6

## K-12 Science Discipline Questions

1. How do we question, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions:

1. How do we question, investigate and explain the Earth and the Universe?(1)
  2. How does Earth Science impact us and the rest of the world? (2)
  3. How are the structures within the Earth's systems related to their functions? (3)
  4. What are the roles of matter and energy within Earth's systems? (4)
  5. What is the responsibility of scientifically literate individuals' impact on their environment? (5)
- 

## Unit 5: Science and Technology in Society

Duration of Unit: 9 weeks

### Unit Questions:

1. How does water moving across and through Earth's materials interact with the products of human activities? ( 2, 5)
2. How does water interact with Earth's physical structures and weather systems? ( 3, 4)

### Unit Objectives:

#### Locate and Recall

1. **Observe and record** the unique physical and chemical properties of water.
2. **Demonstrate** knowledge of the differences in quantities between fresh and salt water covering the Earth's surface.

#### Integrate and Interpret

3. **Explain** the role of septic and sewage systems on the quality of surface and ground water including the general structure, processes and limitations.
4. **Investigate** how human activity impacts local water resources.
5. **Investigate** and explain how substances, both natural and manmade, dissolve in and are carried by surface water.

#### Critique and Evaluate

6. **Inspect and reflect** on local maps to locate and identify the major watersheds that drain into Long Island Sound, analyzing how the topography influences the way the water moves.
7. **Research and evaluate** your role in point and non-point source pollution in Connecticut.
8. **Debate** local laws designed to protect water resources.

### Core Vocabulary:

**15-1:** specific heat, hydrosphere, evaporation, condensation, water cycle, transpiration

**15-2:** polarity, cohesion, adhesion

**15-3:** water quality, point source pollution, nonpoint source pollution, nitrate, turbidity, bioindicator, remote sensing

**17-1:** freshwater, alpine glacier, ice sheet, sea ice, ice core

**17-2:** run off, stream, watershed, estuary, lake

**17-3:** groundwater, water table, porosity, permeability, aquifer, wetland

### Common Assessment: Dig in

**ER9 Science**

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**Life Science – Grade 7**

# Grade 7 Life Science

## K-12 Science Discipline Questions

1. How do we explore, investigate and explain the world around us?
2. How does science impact us and the rest of the universe?
3. How are the structures within a system related to their functions?
4. What are the roles of matter and energy within systems?
5. What is the responsibility of a scientifically literate individual?

## Course Level Questions

1. How is scientific knowledge created and communicated? (1)
2. How do matter and energy flow through an ecosystem? (4)
3. What is the role of energy in our world? (4)
4. How are organisms structured to ensure efficiency and survival? (3)
5. How do science and technology affect the quality of our lives? (2,5)
6. What processes are responsible for life's unity and diversity? (3)

# Grade 7 Life Science

## K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. How do matter and energy flow through an ecosystem? (4)
  3. What is the role of energy in our world? (4)
  4. How are organisms structured to ensure efficiency and survival? (3)
  5. How do science and technology affect the quality of our lives? (2,5)
  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 1: Nature and History of Science

Duration of Unit: 4 weeks

### Unit Questions:

1. What are the science skills necessary to conduct an investigation using the scientific method? (1)
2. How is data used to communicate scientific findings? (1, 5)

### Unit Objectives:

#### Locate and Recall:

1. **Identify** questions that can be answered through scientific investigation.
2. **Identify** independent and dependent variables, and those variables that are kept constant, when designing an experiment.
3. **Use** appropriate tools and techniques to **make observations** and gather data.
4. **State** the significance of various scientists' contributions throughout history.

#### Integrate and Interpret:

5. **Read, interpret and examine** the credibility of scientific claims in different sources of information.
6. **Design and conduct** appropriate types of scientific investigations to answer different questions.
7. Use mathematical operations to **analyze and interpret** data.

#### Critique and Evaluate:

8. **Identify and present** relationships between variables in appropriate graphs.
9. **Draw conclusions** and **identify** sources of error.
10. **Provide explanations** to investigated problems or questions.

## Grade 7 Life Science

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. How do matter and energy flow through an ecosystem? (4)
  3. What is the role of energy in our world? (4)
  4. How are organisms structured to ensure efficiency and survival? (3)
  5. How do science and technology affect the quality of our lives? (2,5)
  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 2: Characteristics of Life

Duration of Unit: 3 weeks

### Unit Questions:

1. What are the origins and characteristics of living organisms? (4,6)
2. What are the chemical processes necessary for life? (2,3,4)

### Unit Objectives:

#### Locate and Recall:

1. **Trace** energy conversions that occur in the human body.
2. **Identify** the characteristics of all living organisms.
3. **Compile** a list of elements necessary for life to exist.

#### Integrate and Interpret:

4. **Discuss and chart** the reasons why water is essential for life
5. **Compare and contrast** the energy transfers and matter cycling among producers, consumers and decomposers
6. **Describe** the cyclic relationship between photosynthesis and cellular respiration.
7. **Investigate and report** on the effects of abiotic factors on a plant's ability to carry out photosynthesis.

#### Critique and Evaluate:

8. **Present** an oral or written argument to support the claim that "The sun is the source of energy to support life on Earth."

## Grade 7 Life Science

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
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  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. How do matter and energy flow through an ecosystem? (4)
  3. What is the role of energy in our world? (4)
  4. How are organisms structured to ensure efficiency and survival? (3)
  5. How do science and technology affect the quality of our lives? (2,5)
  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 3: Classification of Life and Dynamics of Ecosystems

**Duration of Unit:** 10 weeks

### **Unit Questions:**

1. How has life been classified, and how does this relate to life's development on earth?  
(1,4,6)
2. What are the ecological dynamics of our biosphere? (2,3)

### **Unit Objectives:**

#### Locate and Recall:

1. **Identify** the key characteristics of organisms in each of the kingdoms.

#### Integrate and Interpret:

2. **Explain** the interdependence between biotic and abiotic factors within a given ecosystem.
3. **Compare and contrast** living organisms that are single celled with multicellular organisms.

#### Critique and Evaluate:

4. **Evaluate** the impacts of environmental changes caused by nature and by humans

# Grade 7 Life Science

## K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

## Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. How do matter and energy flow through an ecosystem? (4)
  3. What is the role of energy in our world? (4)
  4. How are organisms structured to ensure efficiency and survival? (3)
  5. How do science and technology affect the quality of our lives? (2,5)
  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 4: Cells and Cellular Processes

**Duration of Unit:** 8 weeks

### Unit Questions:

1. What is the evolutionary development of cells from prokaryotic to eukaryotic cells, and what is the significance of their structural changes? (4)
2. How do the basic structures of plant and animal cells function to support life? (4)
3. How has our knowledge of the structure and function of cells been used in biotechnology? (5)

### Unit Objectives:

#### Locate and Recall:

1. **Illustrate and describe** in writing the structure and the function of the cell membrane, cytoplasm, mitochondria and nucleus in an animal cell.
2. **Illustrate and describe** the structural differences between bacterial and animal cells.

#### Integrate and Interpret:

3. **Compare and contrast** living organisms that are single celled with multicellular organisms.
4. **Explain** how the structure and function of multicellular organisms (animals) is dependent on the interaction of cells, tissues, organs and organ systems.
5. **Investigate and describe** in writing different types of microbes and the environmental conditions necessary for their survival.
6. **Describe** the optimum conditions for rapid bacterial growth.
7. **Discover and discuss** how humans use bacteria to produce food and identify examples.

#### Critique and Evaluate:

8. **Evaluate and report** how each method of food preservation including dehydration, pickling, irradiation and refrigeration works to stop or inhibit bacterial growth and give examples of each.

## Grade 7 Life Science

### K-12 Science Discipline Questions:

1. How do we explore, investigate and explain the world around us?
  2. How does science impact us and the rest of the universe?
  3. How are the structures within a system related to their functions?
  4. What are the roles of matter and energy within systems?
  5. What is the responsibility of a scientifically literate individual?
- 

### Course Level Questions:

1. How is scientific knowledge created and communicated? (1)
  2. How do matter and energy flow through an ecosystem? (4)
  3. What is the role of energy in our world? (4)
  4. How are organisms structured to ensure efficiency and survival? (3)
  5. How do science and technology affect the quality of our lives? (2,5)
  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 5: DNA, Genetics, and Heredity

**Duration of Unit:** 4 weeks

### **Unit Questions:**

1. How does the structure, location, and function of chromosomes, genes, and DNA relate to each other in a living cell? (4)
2. How are genetic traits passed from one generation to another? (4,6)
3. What impact does the application of our knowledge of genetics have on humans and our environment? (1,5)

### **Unit Objectives:**

#### Locate and Recall:

1. **Illustrate and chart** the purpose, cell type (somatic and germ) and resulting chromosome count during cell division in mitosis and meiosis.
2. **Demonstrate** the relationship of corresponding genes on pairs of chromosomes to traits inherited by offspring.

#### Integrate and Interpret:

3. **Describe** in writing the role of the germ cells in the formation of the human zygote and its resulting 23 pairs of chromosomes, the 23rd of which determines gender and the other 22 of which determine the characteristics of that offspring.

#### Critique and Evaluate:

4. **Relate** the continued existence of any species to its successful reproduction and explain in writing the factors that contribute to successful reproduction.

## Grade 7 Life Science

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### Course Level Questions:

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  6. What processes are responsible for life's unity and diversity? (3)
- 

## Unit 6: Human Body

Duration of Unit: 6 weeks

### Unit Questions:

1. What are the structures and functions of the human digestive, circulatory, and respiratory systems? (4)
2. How do the digestive, circulatory, and respiratory systems function to bring oxygen and nutrients to the cells and expel waste materials? (4)
3. How does the musculoskeletal system support the body and allow for movement? (4)
4. How does a selected variable affect the function of the circulatory system? (1,4)

### Unit Objectives:

#### Locate and Recall:

1. **Label** the major parts of the human respiratory system and explain in writing the function of each part (nasal cavity, trachea, bronchi, lungs and diaphragm).
2. **Label** the major parts of the human circulatory system and explain in writing the function of each part (heart, veins, arteries and capillaries).
3. **Label** the major parts of the human digestive system and explain in writing the function of each part in the chemical and physical breakdown of food (mouth, esophagus, stomach, small intestine, large intestine and rectum).

#### Integrate and Interpret:

4. **Explain** how the structure and function of multicellular organisms (animals) is dependent on the interaction of cells, tissues, organs and organ systems.
5. **Investigate and explain** in writing the basic structure and function of the human skeletal system
6. **Demonstrate** how the muscles, tendons, ligaments and bones interact to support the human body and allow movement.
7. **Design and conduct** controlled variable experiments to analyze the interaction between the circulatory and respiratory systems as the demand for oxygen changes.

#### Critique and Evaluate:

8. **Differentiate** between the structures and range of motion associated with ball, socket and hinge joints and relate human joints to simple machines.

**ER9 Science**

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**Physical Science – Grade 8**

# Physical Science – Grade 8

## K-12 Science Discipline Questions

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## Course Level Questions

1. How is scientific knowledge created or communicated? (1)
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3. How does the structure of matter affect the properties and uses of materials? (3)
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5. What makes objects move the way they do? (4)
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## Physical Science – Grade 8

### K-12 Science Discipline Questions

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### Course Level Questions:

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## UNIT 1: Science Process and Measurement

**Duration of Unit:** 4 weeks

### UNIT QUESTIONS:

1. How do scientists apply the scientific method of problem solving to answer questions? (1)
2. How do scientists utilize appropriate tools to design and conduct experiments? (1,2)
3. How do scientists analyze scientific data? (1,5)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Identify** questions that can be answered through scientific investigation.
2. **Identify** independent and dependent variables, and those variables that are kept constant, when designing an experiment.

#### Integrate and Interpret:

3. **Design and conduct** appropriate types of scientific investigations to answer different questions.
4. **Use** appropriate tools and techniques to make observations and gather data.
5. **Identify and present** relationships between variables in appropriate graphs.
6. **Provide** explanations to investigated problems or questions.
7. **Communicate** about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

#### Critique and Evaluate:

8. **Read, interpret and examine** the credibility of scientific claims in different sources of information.
9. **Use** mathematical operations to analyze and interpret data.
10. **Draw** conclusions and identify sources of error.

## PERFORMANCE ASSESSMENT: Keep it Hot lab assessment

## Physical Science – Grade 8

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- 

## UNIT 2: Matter and Energy

Duration of Unit: 4.5 weeks

### UNIT QUESTIONS:

1. What is the role of matter and energy in our world? (3,4)
2. What is the difference between physical and chemical properties and changes? (3)
3. What are the forms of energy? (4)
4. How is energy transferred and transformed? (4)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Define** the basic properties of matter.
2. **Show** that different substances float or sink in water depending on their density.
3. **Identify** different forms of energy.
4. **Identify** the relationships between temperature, pressure and volume of gases.

#### Integrate and Interpret:

5. **Distinguish** between mass and density.
6. **Explain** that density is a ratio of mass to volume.
7. **Compare and contrast** physical and chemical properties and changes.
8. **Describe** how energy can be converted from one form to another for use by humans (e.g., thermal, electrical, light, chemical, mechanical).
9. **Demonstrate** the arrangement and motion of atoms or molecules in solids, liquids and gases.
10. **Describe** the effect of heating on the movement of molecules in solids, liquids and gases.
11. **Predict** the phase change that will result from the absorption or release of heat energy by solids, liquids or gases.

#### Critique and Evaluate:

12. Use evidence to support or refute a claim that a chemical reaction has occurred.

### PERFORMANCE ASSESSMENT: Statue of Liberty lab (optional)

## Physical Science – Grade 8

### K-12 Science Discipline Questions

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### Course Level Questions:

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## UNIT 3: Motion and Forces

Duration of Unit: 6.5 weeks

### UNIT QUESTIONS:

1. What makes objects move the way they do? (4,5)
2. How do scientists measure motion? (5)
3. What is the nature of force? (4,5)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Calculate** the average speed of an object and distinguish between instantaneous speed and average speed of an object.
2. **Illustrate** how the circular motion of an object is caused by a center seeking force (centripetal force) resulting in the object's constant acceleration.

#### Integrate and Interpret:

3. **Demonstrate** how forces, including gravity and friction, act upon an object to change its position over time in relation to a fixed point of reference.
4. **Create** and interpret distance-time graphs for objects moving at constant and non-constant speeds.
5. **Predict** the motion of an object given the magnitude and direction of forces acting upon it (net force).
6. **Investigate and demonstrate** how unbalanced forces cause acceleration (change in speed and/or direction of an object's motion).
7. **Express** mathematically how the mass of an object and the force acting on it affect its acceleration.
8. **Design and conduct** an experiment to determine how gravity and friction (air resistance) affect a falling object.

#### Critique and Evaluate:

9. **Assess** the relationship between an object's mass and its inertia when at rest and in motion.
10. **Demonstrate** how Newton's Laws of motion apply to everyday activities.

### PERFORMANCE ASSESSMENT: Shipping & Sliding lab assessment

## Physical Science – Grade 8

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## UNIT 4: STS-Bridges

Duration of Unit: 1.0 week

### UNIT QUESTIONS:

1. How is bridge construction related to materials and forces? (2,3)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Identify** the forces acting on a truss, beam and suspension bridge, including compression, tension and gravity using models, pictures or diagrams.

#### Integrate and Interpret:

2. **Explain** the advantages and disadvantages of truss, beam and suspension bridge design and visually identify each bridge.
3. **Conduct** an experiment to discover and report on a bridge's ability to support a load based upon the interplay of tension and compression forces that result in a net force of zero.
4. **Use** technology to simulate how engineers plan, test and revise designs of bridges given parameters, including cost, time, safety and aesthetics.

#### Critique and Evaluate:

5. **Critique and evaluate** bridge types.

## Physical Science – Grade 8

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## UNIT 5: Energy and Work

Duration of Unit: 2.0 – 4.0 weeks

### UNIT QUESTIONS:

1. How do machines make work easier? (4,5)
2. How are work and energy related? (4,5)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Calculate** work done on an object as force or distance varies.
2. **Discuss** different forms of energy and describe how they can be converted from one form to another for use by humans (e.g., thermal, electrical, light, chemical, mechanical).
3. **Trace** energy conversions that occur in the human body.
4. **Calculate** potential and kinetic energy and relate those quantities to total energy in a system.
5. **Identify** the six types of simple machines.

#### Integrate and Interpret:

6. **Explain** how the six simple machines make work easier but do not alter the amount of work done on an object.
7. **Determine** ways to modify a simple machine (inclined plane, pulley and lever) to improve its mechanical advantage.
8. **Use** a diagram or model of a moving object (roller coaster, pendulum, etc.) to describe the conversion of potential energy into kinetic energy and vice versa.

#### Critique and Evaluate:

9. **Defend** the statement, “Work output of a machine is always less than work input because of energy lost due to friction.”
10. **Design and create** a working compound machine from several simple machines.

## Physical Science – Grade 8

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## UNIT 6: Elements, Mixtures and Compounds

Duration of Unit: 3.5 weeks

### UNIT QUESTIONS:

1. How is matter classified? (3)
2. How are physical and chemical properties used to separate matter? (3)
3. How does the structure of matter affect the properties and use of materials? (3)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Define** the characteristics of elements, compounds, and mixtures.
2. **Describe** how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.

#### Integrate and Interpret:

3. **Differentiate** between a mixture and an element or compound and identify examples.
4. **Explain** how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.
5. **Conduct and report** on an investigation that uses physical means such particle size, density, solubility or magnetism to separate substances in a mixture.

#### Critique and Evaluate:

6. **Evaluate** the effectiveness of different methods of separating mixtures.

## Physical Science – Grade 8

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## UNIT 7: Atomic Structure and Periodic Table

**Duration of Unit:** 5.0 weeks

### UNIT QUESTIONS:

1. How is the Periodic Table of elements organized? (3)
2. What is the structure of the atom? (3,4)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Describe** the general structure of the atom.
2. **Trace** the history of development of atomic theory.
3. **Identify** the families of elements in the periodic table.

#### Integrate and Interpret:

4. **Draw** models to show that atoms have a positively charged nucleus surrounded by negatively charged electrons.
5. **Compare and contrast** the properties of a metals, nonmetals and metalloids.
6. **Use** the Periodic Table to locate metals, metalloids and nonmetals and to predict the general characteristics of an element.
7. **Explain** how the properties of the first 20 elements in the Periodic Table are related to their atomic structures.
8. **Explain** how the configuration of atoms and molecules determines the properties of the materials.

#### Critique and Evaluate:

9. **Visualize, design, and build** a model of an element.
10. **Evaluate** information sources for a brochure on an element.

### PERFORMANCE ASSESSMENT: Element Project

## Physical Science – Grade 8

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## UNIT 8: Chemical Bonding and Chemical Reactions

Duration of Unit: 3.0 - 5.0 weeks

### UNIT QUESTIONS:

1. How do scientists classify chemical reactions? (3,4)
2. How do elements form chemical bonds? (3,4)

### UNIT OBJECTIVES:

#### Locate and Recall:

1. **Define** the main types of chemical bonding.
2. **Describe** how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding).
3. **Define** the different types of chemical reactions.
4. **Identify** the parts of chemical reactions.

#### Integrate and Interpret:

5. **Explain** the chemical composition of acids and bases, and explain the change of pH in neutralization reactions.
6. **Compare** exothermic and endothermic chemical reactions.
7. **Explain** the role of activation energy in chemical reactions.
8. **Predict** chemical formulas using different methods.

#### Critique and Evaluate:

9. **Analyze** chemical reactions to determine the type, identify reactants and products, and energy flow.

## Physical Science – Grade 8

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## **UNIT 9: Physical Science Investigations (optional)**

**Duration of Unit:** 2.0 weeks

### **UNIT QUESTIONS**

To be determined.

### **UNIT OBJECTIVES:**

To be determined.

**\*Time may need to be allocated for final exam scheduling.**