Young Scholars of Western Pennsylvania Charter School

8th Grade Science Curriculum Framework

- Grade

  8

  Big Idea

  Scientists use specific methods to investigate problems.

  Essential Questions

  Concepts

  Scientific Method

  Competencies

  Students should be able to explain how the scientific method could be applied to solve problems.

  Vocabulary

  Observation Hypothesis Experiment Analyze Theory Law

  Standard(s)

  S8.A 2.1.1 S8.A.2.1.2 S8.A.2.1.3 S8.A. 2.1.4 S8.A. 2.1.5 S8.A. 2.1.6

  Eligible Content

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  Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Concepts

The phases of the Moon are caused by the orbit of the moon around the Earth.

Competencies

Identify, measure, and explain monthly patterns in the phases of the Moon.

Use a model of the relative positions of the sun, earth and moon to explain the phases of the moon.

Vocabulary

Measure

Pattern

Phase

Standard(s)

3.3.4.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Concepts

Changes in seasons are due to the inclination of Earth's axis of rotation combined with Earth's orbit around the Sun.

Competencies

Identify and explain the position and orientation of the Earth as it orbits the Sun.

Identify and explain cyclical patterns of seasonal changes in terms of length of day and sunrise/sunset.

Vocabulary

Position

Orbit

Cyclical Pattern

Season

Axis

Rotation

Standard(s)

3.3.4.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Concepts

Observable patterns and changes in tides are caused by the Earth-Moon-Sun system.

Competencies

Use models of the Earth-Sun-Moon system to support explanations and predict the cyclic patterns of tides.

Vocabulary

Tide

System

Standard(s)

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Concepts

Observable eclipses are caused by motions in the Earth-Moon-Sun system.

Competencies

Use models of the Earth-Sun-Moon system to support explanations and predict the cyclic patterns of eclipses.

Vocabulary

Eclipse

Standard(s)

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Concepts

Earth’s spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun. The seasons are a result of the Earth’s tilt on its axis and are caused by the differential intensity of sunlight on different areas of Earth across the year.

Competencies

Use models of Earth's orientation and motion to explain how seasonal changes in intensity and duration of daily sunlight lead to seasons

Vocabulary

Earth Orientation

Tilt

Axis

Standard(s)

3.3.6.B2, 3.3.7.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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8

Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

How do objects in the universe appear and behave?

Concepts

The universe began with a period of extreme and rapid expansion known as the Big Bang.

Competencies

Communicate technical information about how technology has led to discoveries of the expansion scale of the universe and about the scientific theories that explain these observations.

Vocabulary

Big Bang

Scientific Theory

Universe

Standard(s)

3.3.6.B1, 3.3.5.B1, 3.3.7.B1, 3.3.7.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

How do objects in the universe appear and behave?

Concepts

Earth and its solar system are part of the Milky Way Galaxy, which is one of many galaxies in the universe.

Competencies

Construct and use scale models to describe the relationship of Earth to the rest of the solar system, the Milky Way Galaxy, and the universe

Vocabulary

Model

Galaxy

Universe

Standard(s)

3.3.6.B1, 3.3.5.B1, 3.3.7.B1, 3.3.7.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

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Big Idea

The universe is composed of a variety of different objects which are organized into systems each of which develops according to accepted physical processes and laws.

Essential Questions

How do objects in the universe appear and behave?

Concepts

Our solar system is a collection of objects, including planets, their moons, and asteroids that are in orbit around the Sun.

Competencies

Construct and use scale models of the solar system to support the explanation of the motions of the planets of the observed system.

Vocabulary

Model

Solar System

Asteroids

Standard(s)

3.3.5.B1, 3.3.6.B1, 3.3.7.A4, 3.3.7.B1, 3.3.6.B2, 3.3.7.B2

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

S8.D.3.1.1

S8.D.3.1.2

S8.D3.1.3

- Grade

8

Big Idea

The Earth's processes affect and are affected by human activities.

Essential Questions

How do Earth's processes and human activities affect each other?

Concepts

Humans depend on Earth’s land, ocean, atmosphere, and living things for many different resources.

Competencies

Use maps and other data to explain how geologic processes have led to the uneven distribution of Earth's natural resources.

Vocabulary

Map

Resources

Atmosphere

Land

Ocean

Geologic Processes

Standard(s)

S8.D.1.1

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

- Grade

8

Big Idea

The Earth's processes affect and are affected by human activities.

Essential Questions

How do Earth's processes and human activities affect each other?

Concepts

Minerals, fresh water, and living resources are limited, and many are not renewable or replaceable over human lifetimes.

Competencies

Use maps and other data to explain how geologic processes have led to the uneven distribution of Earth's natural resources.

Vocabulary

Maps

Resources

Fresh Water

Geologic Processes

Standard(s)

S8.D.1.1

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

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8

Big Idea

The Earth's processes affect and are affected by human activities.

Essential Questions

How do Earth's processes and human activities affect each other?

Concepts

N/A

Competencies

N/A

Vocabulary

N/A

Standard(s)

N/A

Eligible Content

N/A

- Grade

8

Big Idea

The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Essential Questions

How do we describe and interpret Earth's features, their origins and the processes that shape them?

Concepts

Greenhouse gases in the atmosphere absorb and retain the energy radiated from land and ocean surfaces, thereby regulating earth's average surface temperatures and keeping it habitable.

Competencies

Use models of earth's atmosphere and surface to support the explanation of the greenhouse effect.

Vocabulary

Atmosphere

Greenhouse Effect

Habitable

Standard(s)

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

- Grade

8

Big Idea

The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Essential Questions

How do the properties and movement of water shape Earth and affect its systems?

Concepts

Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation as well as downhill flows on land.

Competencies

Investigate movement of water in the Earth's systems and research and develop models for the cycling of water.

Investigate water systems to identify seasonal and annual variations in precipitation and stream flow and the causes of those variations.

Vocabulary

Water Cycle

Water System

Precipitation

Transpiration

Atmosphere

Standard(s)

3.3.5.A4, 3.3.6.A4, 3.3.8.A4

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

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8

Big Idea

The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Essential Questions

How do the properties and movement of water shape Earth and affect its systems?

Concepts

Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things.

These interactions vary with latitude, altitude and local and regional geography.

Competencies

Collect data and generate evidence to show how changes in weather conditions result from the motions and interactions of air masses.

Construct and use models to support the explanation of how the unequal heating of earth's surface and earth's rotation result in patterns of atmospheric and oceanic circulation that vary with latitude, altitude and local and geographical land distribution.

Vocabulary

Oceanic Circulation

Altitude

Latitude

Geography

Weather

Climate

Standard(s)

3.3.7.A6, 3.3.6.A6, 3.3.6.A5, 3.3.8.A4

Eligible Content

S8.A.1.1

S8.1.2

S8.A.1.3

S8.A.2.1

S8.A.2.2

S8.A.3.1

S8.A.3.2

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8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

Competencies

Use a drawing or physical representation of simple wave properties to explain brightness (amplitude) and color (frequency / wavelength).

Vocabulary

Wave

Wave Length

Amplitude

Frequency

Brightness

Color

Standard(s)

3.2.7.B5

Eligible Content

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

A sound wave needs a medium through which it is transmitted.

Competencies

Plan and carry out investigations of sound traveling through various types of mediums and lack of medium to determine whether a medium is necessary for the transfer of sound waves.

Vocabulary

Medium

Sound Wave

Vacuum

Standard(s)

3.2.5.B5

Eligible Content

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.

Competencies

Construct explanations of how waves are reflected, absorbed or transmitted through an object, considering the material the object is made from and the frequency of the wave.

Vocabulary

Light

Reflection

Absorption

Transmission

Frequency

Color

Standard(s)

3.2.7.B5

Eligible Content

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

The path that light travels can be traced as straight lines, except at surfaces between different transparent materials where the light path bends.

Competencies

Use empirical evidence to support the claim that light travels in straight lines except at surfaces between different transparent materials.

Vocabulary

Light

Transparent

Standard(s)

3.2.3.B5

3.2.4.B5

Eligible Content

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

Appropriately designed technologies (e.g., radio, television, cell phones, wired and wireless computer networks) make it possible to detect and interpret many types of signals that cannot be sensed directly.

Competencies

Apply scientific knowledge to explain the application of waves in common communication designs.

Vocabulary

Signals

Standard(s)

3.4.6.E4

Eligible Content

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.

Competencies

Construct explanations of how waves are reflected, absorbed or transmitted through an object, considering the material the object is made from and the frequency of the wave.

Vocabulary

Seismic Waves

Reflection

Absorption

Transmission

Standard(s)

3.2.7.B5

3.4.6.E4

Eligible Content

S8.A.1.3

S8.A.2.2

S8.A.2.1

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

A wave model of light is useful for explaining brightness (amplitude), color (frequency / wavelength), and the frequency-dependent bending of light at a surface between media.

Competencies

Use a drawing or physical representation of the wave model of light to explain the change in direction of wave due to a change in its medium

Vocabulary

Wave Model

Brightness

Amplitude

Color

Frequency

Wavelength

Refraction

Medium

Standard(s)

3.2.4.B5

Eligible Content

S8.A.1.3

S8.A.2.2

S8.A.2.1

- Grade

8

Big Idea

Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter

Essential Questions

How are waves used to transfer energy and information?

Concepts

Many modern communication devices use digitized signals (sent as wave pulses) as a more reliable way to encode and transmit information.

Competencies

Apply scientific knowledge to explain the application of waves in common communication designs.

Vocabulary

Encode

Transmit

Decode

Wave Pulse

Standard(s)

3.4.7.B3

3.4.6.B4

Eligible Content

S8.A.1.3

S8.A.2.2

S8.A.2.1