**The Solar System**

 60 Minute Space Science Lesson

 Planetarium and Observatory

 Program

 Grades: 3-5

**TEACHER GUIDE**

**Ohio’s Learning Standards**

**Grade 3:** Earth and Space Science – Matter and Forms of Energy

* All objects and substances in the natural world are composed of matter.
* Matter exists in different states, each of which has different properties.

**Grade 4:** Earth and Space Science – Earth’s Surface

* Earth’s surface has specific characteristics and landforms that can be identified.

**Grade 5:** Earth and Space Science – Cycles and Patterns in the Solar System

* The Solar System includes the Sun and all celestial bodies that orbit the Sun. Each planet in the Solar System has unique characteristics.
* The Sun is one of many stars that exist in the Universe.
* Most of the cycles and patterns of motion between the Earth and Sun are predictable.

**Description**

Launch into space in the Shafran Planetarium and fly through the solar system like never before! We’ll view the Earth from space, float over Venus and land on Mars to search for water. Pausing only briefly on the Sun’s surface, our grand tour takes us close-up and personal to the gas giants, Jupiter and Saturn. After inspecting some of the many exotic moons of the outer planets, we’ll see what sunrise on Pluto looks like, and then drift by an icy comet.

**Objectives**

* Name in order, from nearest to farthest from the Sun, the planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.
* Identify any planets visible to the unaided eye in the current evening/morning sky, and name at least three constellations currently visible after sunset.
* List any five objects in the solar system based upon decreasing size. (e.g. Sun, Jupiter, Earth, comet, meteor)
* Describe objects in the solar system based upon their physical state – which is solid, liquid, or gas?)
* Discuss the question: How do we know what we know about the solar system?

**The Solar System**

If this will be your first trip to the Museum for your students you may want to review the following:

**Before Your Museum Visit**

# What is a Museum?

# What is our purpose for visiting The Cleveland Museum of Natural History?

# How should we handle objects at the Museum?

# Introduce the vocabulary and additional resources provided below

**Vocabulary**

**Comet ‑** an icy snowball mixed with dirt that melts when it's close to the Sun.

**Constellations –** star patterns that people use to make pictures of animals, people, monsters, and other objects in the nighttime sky.

**Crater ‑** the mark or depression that forms when a **comet**, **asteroid,** or **meteoroid** hits a planet, moon, comet, or another asteroid.

**Galaxy ‑** a collection of gas clouds and millions or billions of stars that can take on a spiral, elliptical, or irregular shape. The sun is a star in the Milky Way galaxy.

**Meteor, Shooting Star ‑** the momentary streak of light in the sky produced when a meteoroid passes through the Earth's atmosphere.

**Meteorites ‑** rocks from outer space that have fallen to the Earth. They are the oldest rocks in the solar system (4.5 billion years). Some rare meteorites are from the Moon or Mars, but most come from the asteroid belt.

**Meteoroid, Asteroid ‑** a small object made of dust or rock which circles the Sun.

**Moon ‑** an object in an orbit around a planet or **asteroid.** It does not give off its own light and is usually solid.

**Observatory ‑** a building equipped with a telescope for viewing the real sky.

**Orbit ‑** the elliptical path taken by an object around a **planet**, **star**, or **asteroid**.

**Planet ‑** a large object that moves around the Sun in an **orbit**. It does not give off its own light and is not necessarily solid.

**Planetarium ‑** a machine which projects images of stars, moons, and planets on the inside of a large round room with a domed ceiling. The machine rotates to illustrate celestial movements. Also a room housing such a device.

**Revolution ‑** the length of time it takes an object to orbit once around a planet or star.

**Rotation ‑** the length of time it takes an object to spin once around its axis.

**Stars ‑** Luminous hot balls of gas. Stars come in different sizes and colors and, just like our own Sun, they produce their own light.

**Extension Activities**

Interest in the solar system can begin before your trip, and some of the suggestions listed below will help to prepare your students:

1. Find out the names of the moons in the solar system and how they got their names. Many names are derived from mythology, literature, and history.
2. People use mnemonic (ni mon'ik) devices to help them remember lists. The first letter in each word of a nonsense sentence can stand for the first letter of an object on the list. Review the following mnemonic for remembering the planets of the solar system: **M**y **V**ery **E**ducated **M**other **J**ust **S**erved **U**s **N**ine **P**izzas or ask your students to invent their own memory aids.
3. After your visit, continue with other activities to increase your students’ interest and reinforce the learning objectives:
4. Make pictures or 3-dimensional models of the solar system.
5. Keep track of the positions and changes of the Moon and Sun during the year. Students may want to keep a class diary, and write a summary report of their findings at the end of the year.
6. Find a list of the space probes that have visited and will be visiting the planets and moon. What new information are scientists hoping to learn from these spacecraft?
7. Make a list of distances between the Sun and the different planets, and between Earth and the other planets. Calculate how long it would take for light to get from the Sun to each of the planets, and from each planet to Earth. What if students could ride a bike to the Moon? How long would it take to get there? What about driving a car to the Moon?

**Online Resources for Teachers and Students**

Click the link below to find additional online resources. These websites are recommended by our Museum Educators and provide additional content information.

CMNH Educators regularly review these links for quality. Web addresses often change so please notify us if any links have issues. Please note that aside from our own Museum website, the Museum is not affiliated with and does not endorse these online resources.

Cleveland Museum of Natural History https://[www.cmnh.org](http://www.cmnh.org/)/edlinks

The Educator Resource Center offers educator workshops, thematic teaching kits, animal dioramas, and more for loan to area teachers.

Contact the ERC at 216-231-2075 for information on individual or school membership.

Visit the Museum’s ERC website for more information on workshops https://[www.cmnh.org/ERC](http://www.cmnh.org/ERC)

**Hours**

* Monday through Friday, 1 to 5 PM
* Wednesday, 1 to 6 PM
* Saturday, 9 AM to 2 PM

**Materials for Loan**

If you’re interested in additional resources be sure to check out the following ERC materials or browse ERC materials online at

 <http://cmnh.hosting.l4u.com>

Related ERC kits for this topic include:

**All About the Earth, Sun, and Moon:** Start a revolution for students with hands-on activities including globes, models, of Moon phases, eclipse models, and more.

**Exploring the Solar System:** Integrate math with science and blast into outer space! Kit includes a model of the solar system, lithograms for student use, and more.

**OTHER ITEMS:**

**Portable Planetarium:** Launch into space from your own classroom! The STARLAB Portable Planetarium allows you and your students to step into the universe and explore interactive, cross-curricular lessons about astronomy, history and more. This inflatable planetarium can hold 30 students and requires teacher training and reservations through the ERC.

**Educator Resource Center (ERC)**