

ASTRONOMY

GRADE 5

ASSESSMENT PACKET

Discover Martian sunsets, eclipses and transits, what drives Neptune's internal furnace when it's so far from the sun, learn how binary planetary systems work, and more as you construct a spectrometer to split light into its rainbow signatures, investigate the electromagnetic spectrum, and so much more!



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This curriculum is aligned with the National Standards and STEM for Science.

Educational Goals

Astronomy is a fantastic area of science for teachers and students alike because it combines many different fields of science and still leaves a lot of room for wonder and exploration. This section contains many different kinds of astronomy experiments which are easy and fun activities designed to get your feet wet in the field of astrophysics.

Early astronomers tracked the movement of the stars so accurately that in most cases, we've only made minor adjustments to their data. Although Galileo wasn't the first person to look through a telescope, he was the first to point it at the stars. Originally, astronomy was used for celestial navigation and was involved with the making of calendars, but nowadays it's mostly classified in the field called astrophysics.

There are different types of astronomers, some of whom have never looked through a telescope. For example, radio astronomers use satellite dishes to "view" the sky while backyard astronomers use optical telescopes armed with cameras. Professional observational astronomers use computers and specialized camera equipment to look through their X-ray scopes and determine what's out there. And the kid down the street uses a new set of binoculars he got for his birthday. They are all doing astronomy, just in different ways.

Amateur astronomers usually have smaller telescopes, typically 4" to 20" in diameter. They generally don't get paid to do astronomy. They just do it for the love of it, and they are the ones you'll find on sidewalks and sharing views of the sky with the general public during local stargazing events. Many amateur astronomers have discovered new objects based on their raw knowledge of the sky.

Here are the scientific concepts:

- The Earth is one of several planets that orbit the Sun, and the Moon orbits the Earth.
- The solar system consists of planets and other bodies that orbit the Sun in predictable paths.
- The appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.
- How to use astronomical units and light years as measures of distance between the Sun, stars, and Earth.
- The path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.
- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

By the end of the labs in this unit, students will be able to:

- Know how to demonstrate the different kinds of atmospheres on various planets.
- Know the celestial objects in the solar system and how they relate and interact with each other.
- Understand how to determine the structure and composition of celestial objects.
- Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- Measure and estimate the length and volume of objects.
- Formulate and justify predictions based on cause-and-effect relationships.
- Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
- Construct and interpret graphs from measurements.
- Follow a set of written instructions for a scientific investigation.

Astronomy Grade 5 Evaluation

Teacher Section

Overview: Kids will demonstrate how well they understand important key concepts from this section.

Suggested Time: 45-60 minutes

Objectives: Students will be tested on the key concepts of solar astronomy:

- The Earth is one of several planets that orbit the Sun, and the Moon orbits the Earth.
- The solar system consists of planets and other bodies that orbit the Sun in predictable paths.
- The appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.
- How to use astronomical units and light years as measures of distance between the Sun, stars, and Earth.
- The path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.
- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.
- Know how to demonstrate the different kinds of atmospheres on various planets.
- Know the celestial objects in the solar system and how they relate and interact with each other.
- Understand how to determine the structure and composition of celestial objects.

Lab Preparation

1. Print out copies of the student worksheets, lab practical, and quiz.

Lesson

The students are taking two tests today: the quiz and the lab practical. The quiz takes about 20 minutes, and you'll find the answer key to make it easy to grade.

Astronomy Grade 5 Evaluation

Student Worksheet

Overview: Today, you're going to take two different tests: the quiz and the lab practical. You're going to take the written quiz first, and the lab practical at the end of this lab. The lab practical isn't a paper test – it's where you get to show your teacher that you know how to do something.

Lab Test & Homework

1. Your teacher will ask you to share how much you understand about astronomy. Since science is so much more than just reading a book or circling the right answer, this is an important part of the test to find out what you really understand.
2. While you are waiting for your turn to show your teacher how much of this stuff you already know, you get to choose which homework assignment you want to complete. The assignment is due tomorrow, and half the credit is for creativity and the other half is for content, so really let your imagination fly as you work through it. Choose one:
 - a. Write a short story or skit about astronomy from the perspective of the Sun or a light particle itself. You'll read this aloud to your class.
 - b. Make a poster that teaches a main concept of either the Sun, a moon, a planet, or a particular spacecraft. When you're finished, you'll use it to teach to a class of younger students and demonstrate the principles that you've learned.
 - c. Write and perform a poem or song about the Sun, a moon, a planet, or a particular spacecraft. This will be performed to your class.

Astronomy Grade 5 Quiz

Teacher's Answer Key

1. What is a galaxy? *Galaxies are clusters of billions of stars, and may have different shapes. The Sun is one of many stars in our own Milky Way galaxy.*
2. Which planets do not have a magnetic field? *Venus and Mars.*
3. Can you see the Moon during the daytime? *Yes!*
4. How many AUs is the Earth from the Sun? *One. The Earth-Sun distance of 93 million miles is one AU.*
5. What is the Sun made out of, and how much of each? *It's 74% hydrogen and 24% helium, with trace amounts of oxygen, carbon, iron, and neon.*
6. What is a spectrometer, and how do astronomers use it? *A spectrometer is an optical instrument that determines the electromagnetic spectrum of light. It splits the incoming light into its rainbow signatures so astronomers can use it to determine which elements a star is burning.*
7. Can we see all light? If not, which kind can we see with our eyes? *No we can only see a small part of the electromagnetic spectrum: visible or optical light.*
8. How hot is the Sun? *Our Sun is a G-type star, and recent measurements indicate that our Sun is brighter than 85% of the stars in our own galaxy. 15 million °C in the core, and a surface temperature of about 5500°C.*
9. How does the Sun make energy? *The Sun uses nuclear reactions to generate its energy.*
10. Which are light sources and which are seen by reflected light?
 1. Stars light source
 2. The Moon reflected light
 3. Venus reflected light
 4. Pluto reflected light
 5. Comets reflected light
 6. Asteroids reflected light
 7. The Sun light source

Astronomy Grade 5 Quiz

Student Quiz Sheet

Name_____

1. What is a galaxy?
2. Which planets do not have a magnetic field?
3. Can you see the Moon during the daytime?
4. How many AUs is the Earth from the Sun?
5. What is the Sun made out of, and how much of each?
6. What is a spectrometer, and how do astronomers use it?
7. Can we see all light? If not, which kind can we see with our eyes?
8. How hot is the Sun?
9. How does the Sun make energy?

10. Which are light sources (LS) and which are seen by reflected light (RL)?

- a. Stars _____
- b. The Moon _____
- c. Venus _____
- d. Pluto _____
- e. Comets _____
- f. Asteroids _____
- g. The Sun _____

Astronomy Grade 5 Lab Practical

Teacher's Answer Key

This is your chance to see how well your students have picked up on important key concepts, and if there are any holes. Your students also will be working on their homework assignment as you do this test individually with the students.

Materials

- Sheets of paper
- Pencil

Lab Practical: Ask the student *Note: Answers given in italics!*

- On a sheet of paper, draw the solar system. Include the Sun, eight planets, and the Asteroid Belt. Approximate the scale of the planets and distances between them. *Students will draw the largest object to be the Sun. The next four are nearly the same size dots and bunched up within the first half inch of the paper. Jupiter is the largest planet circle, Saturn is the second largest planet circle, and the spacing between the two ice giants is larger than the space between the two gas giants. The Asteroid Belt is between Mars and Jupiter. (See table below for exact distances for reference.)*

Planet/Object	Distance from the Sun	Distance from the Sun
Mercury	0.11 inches	2 mm
Venus	0.21 inches	5 mm
Earth	0.30 inches	7 mm
Mars	0.45 inches	11 mm
Jupiter	1.56 inches	3.9 cm
Saturn	2.87 inches	7.2 cm
Uranus	5.77 inches	14.6 cm
Neptune	9.05 inches	22.9 cm

Astronomy Grade 5 Lab Practical

Student Lab Worksheet

This is your chance to show how much you have picked up on important key concepts, and if there are any holes. You also will be working on a homework assignment as you do this test individually with a teacher.

Materials

- Sheets of paper
- Pencil

Lab Practical:

- On a sheet of paper, draw the solar system. Include the Sun, eight planets, and the Asteroid Belt. Approximate the scale of the planets and distances between them.