



THE STAR★WITNESS

Supplemental Educational Support Materials for Special Feature: “Preparing for Hubble’s Servicing Mission 4 (‘SM4’)”

Discussion questions

Q1.

What characteristics make the Hubble Space Telescope a leading, state-of-the-art observatory?

Answer:

The Hubble Space Telescope is the first visible-light telescope in space. A space-based observatory provides data and images that are free from the blurring effects of Earth’s atmosphere. The team that built the telescope designed it with periodic servicing in mind. Delivering new instruments and operating parts to the telescope allows it to remain a state-of-the-art observatory.

Q2.

What are the benefits of servicing the telescope?

Answer:

Servicing Hubble allows astronauts to install instruments that contain the newest available technology. With state-of-the-art instruments, Hubble’s scientific power is boosted and the telescope remains a leading observatory. If there were no servicing missions to Hubble, the telescope would be operating with the original instruments installed before launch.

Astronauts also can replace worn-out parts, such as batteries, gyroscopes, solar panels, and sensors. The new replacement parts keep vital functions working properly and extend the life of the telescope.

Q3.

Explain how the new instruments, COS and WFC3, will boost Hubble’s scientific power.

Answer:

COS will examine ultraviolet light streaming from distant objects. The new instrument will allow Hubble to study galaxy formation and the births of stars and planetary systems. COS will complete observations much faster than Hubble’s previous spectrograph.

WFC3 will greatly improve Hubble’s ability to image large and distant objects, such as galaxies and clusters of galaxies, as well as planets in our solar system. WFC3 will allow Hubble to see objects that are about five times fainter than Hubble’s landmark deep view of the cosmos, called the Hubble Deep Field, taken in 1996 with WFPC2.

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Q4.

If you could use the Hubble Space Telescope to look at one object in the sky, what would you choose and why?

Answer:

Your answers will depend on which celestial object is your favorite. The object may be inside or outside the solar system. Note that Hubble cannot look at Earth, the Sun, or Mercury because they are too bright and would damage the telescope's instruments. Venus and Earth's Moon are also close and bright, making them difficult (but not impossible) targets for Hubble to capture.

Vocabulary words

Atmosphere

The layer of gases surrounding the surface of a planet, moon, or star.

Celestial

Of or relating to the sky or visible objects in the sky, like the Moon, Sun, planets, comets, asteroids, stars, and galaxies.

Observation

In science, an observation is a fact or occurrence that is noted and recorded. The Hubble Space Telescope is a tool astronomers use to make observations of celestial objects.

Observatory

A structure designed and equipped for making astronomical observations. Observatories are located on Earth and in space.

Orbit

The act of traveling around a celestial body; or the path followed by an object moving around a celestial body. For example, the planets travel around, or orbit, the Sun because the Sun's gravity keeps them in their paths, or orbits.

Primary mirror

A large mirror in a reflecting telescope that captures light from celestial objects and focuses it toward a smaller secondary mirror. The primary mirror in the Hubble Space Telescope measures 94.5 inches (2.4 meters) in diameter.

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Satellite

A man-made object that orbits Earth, the Moon, or another celestial object.

Solar panels

Two rigid, wing-like structures that convert sunlight directly into electricity to operate a space telescope's scientific instruments, computers, and radio transmitters. Some of the energy generated is stored in onboard batteries so the telescope can operate while in Earth's shadow.

Ultraviolet (UV) Light

The part of the electromagnetic spectrum that has slightly higher energy than visible light, and is not visible to the human eye. Just as there are high-pitched sounds that cannot be heard, there is high-energy light that cannot be seen. Too much ultraviolet light causes sunburns.

Visible Light

The part of the electromagnetic spectrum that human eyes can detect; also known as the visible spectrum. The colors of the rainbow make up visible light. Blue light has more energy than red light.

Education standards

McREL Language Arts Standard 7

Uses reading skills and strategies to understand and interpret a variety of informational texts

Level II (Grades 3-5)

1. Uses reading skills and strategies to understand a variety of informational texts (e.g., textbooks, biographical sketches, letters, diaries, directions, procedures, magazines)

Level III (Grades 6-8)

1. Uses reading skills and strategies to understand a variety of informational texts (e.g., electronic texts; textbooks; biographical sketches; directions; essays; primary source historical documents, including letters and diaries; print media, including editorials, news stories, periodicals, and magazines; consumer, workplace, and public documents, including catalogs, technical directions, procedures, and bus routes)

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