

Resources for students and educators of grades K-12

NASA Home Page
www.nasa.gov

NASA Johnson Space Center
www.nasa.gov/johnson

NASA Orion Spacecraft
www.nasa.gov/orion

NASA Space Launch System
www.nasa.gov/sls

NASA Ground Systems
www.nasa.gov/exploration/systems/ground/index.html

“What is Orion?” Education Page
www.nasa.gov/audience/forstudents/5-8/features/what-is-orion-58.html

NASA’s “Beyond Earth”
www.nasa.gov/exploration/home/index.html

NASA’s Education Home Page
www.education.nasa.gov

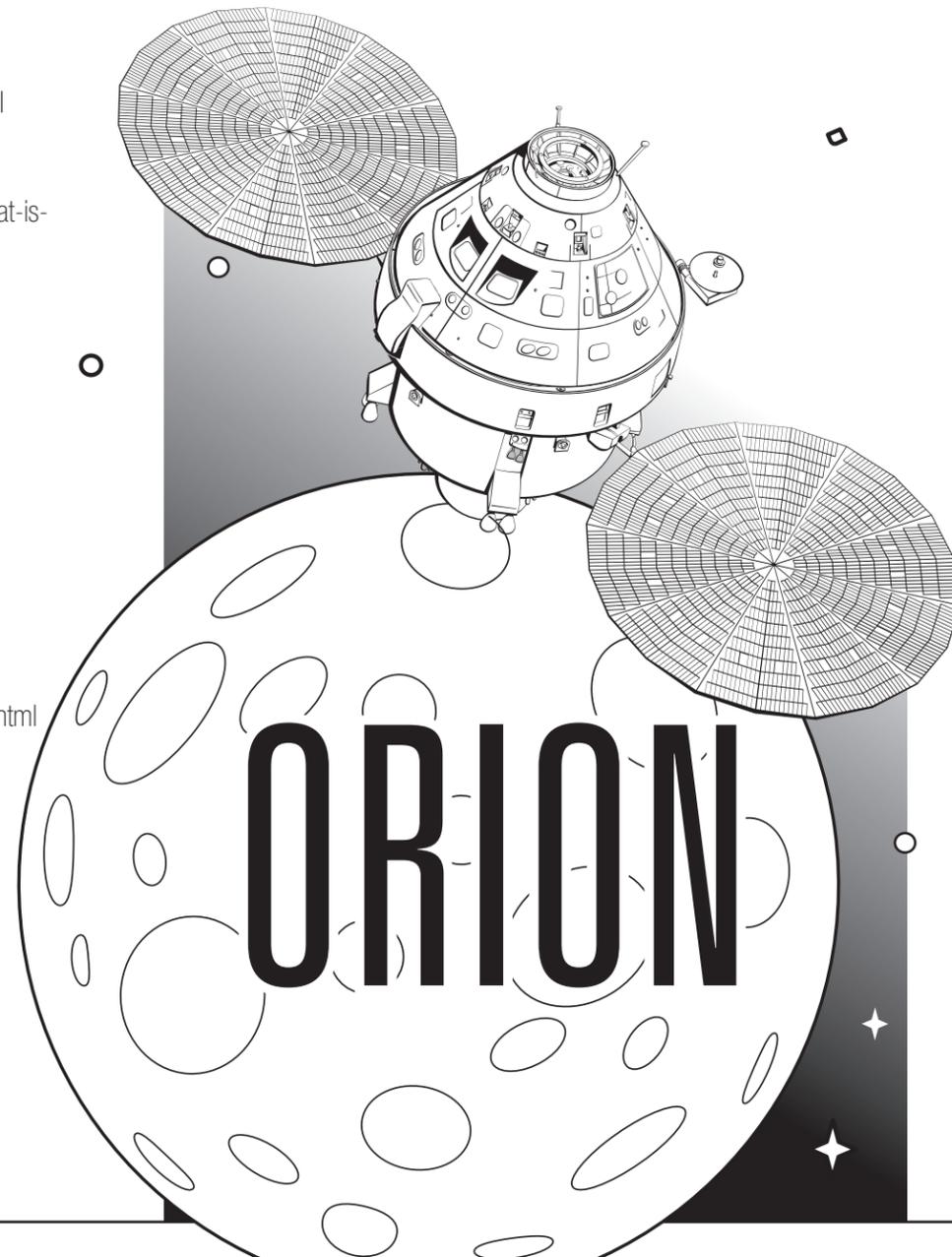
NASA Explorer Schools
www.explorerschools.nasa.gov

NASA Educator Resource Network
www.nasa.gov/audience/foreducators/k-4/learning/F_Educator_Resources_Center_Network.html

National Aeronautics and
Space Administration



Let’s
Explore
With



aMAZing Orion Destinations

Help Orion reach its three potential destinations – the moon, Mars and near-Earth asteroids.

Why Mars?

- Robotic and scientific robotic missions have shown that Mars has characteristics and a history similar to Earth’s, including evidence of water. Humans can build upon this knowledge and look for signs of life and investigate Mars’ geological evolution, resulting in research and methods that could be applied here on Earth.
- A mission to our nearest planetary neighbor provides the best opportunity to demonstrate that humans can live for extended, even permanent, stays beyond low Earth orbit. The technology and space systems required to transport and sustain explorers will drive innovation and encourage creative ways to address challenges.

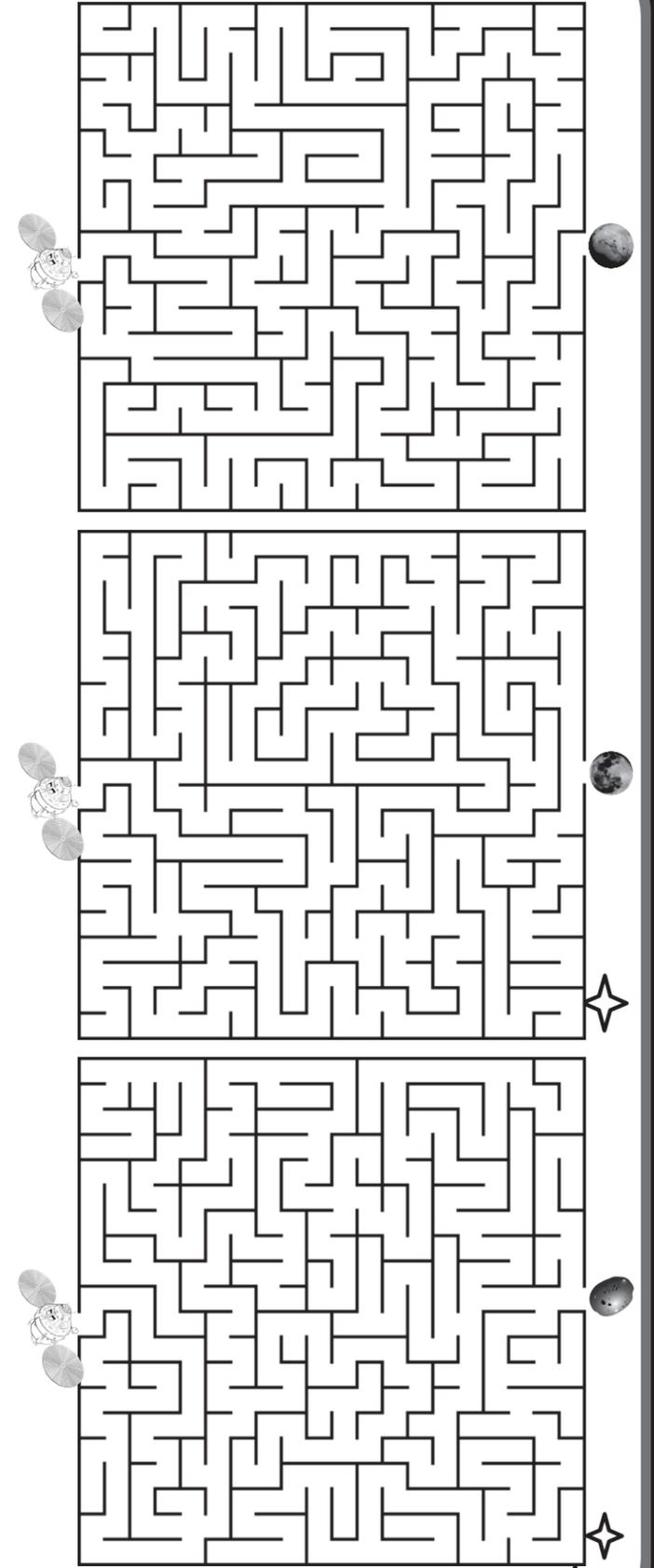
Why the moon?

- The moon offers us a chance to look back at the history of the Earth and how it was formed. Because it has no atmosphere and has been virtually untouched, the moon serves as a history book of the early years of our own planet and our solar system.

Why asteroids?

Orion may travel to a near-Earth asteroid to explore the possibilities for resources that asteroids might hold.

- Near-Earth objects (NEOs) are comets and asteroids that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter the Earth’s neighborhood.
- As the primitive, leftover building blocks of the solar system formation process, comets and asteroids offer clues about the chemical mixture from which planets in our solar system formed billions of years ago.
- The raw materials found in asteroids could be used in developing the space structures and generating the rocket fuel that will be required to explore and colonize our solar system in the 21st century.



*Answers on back page.

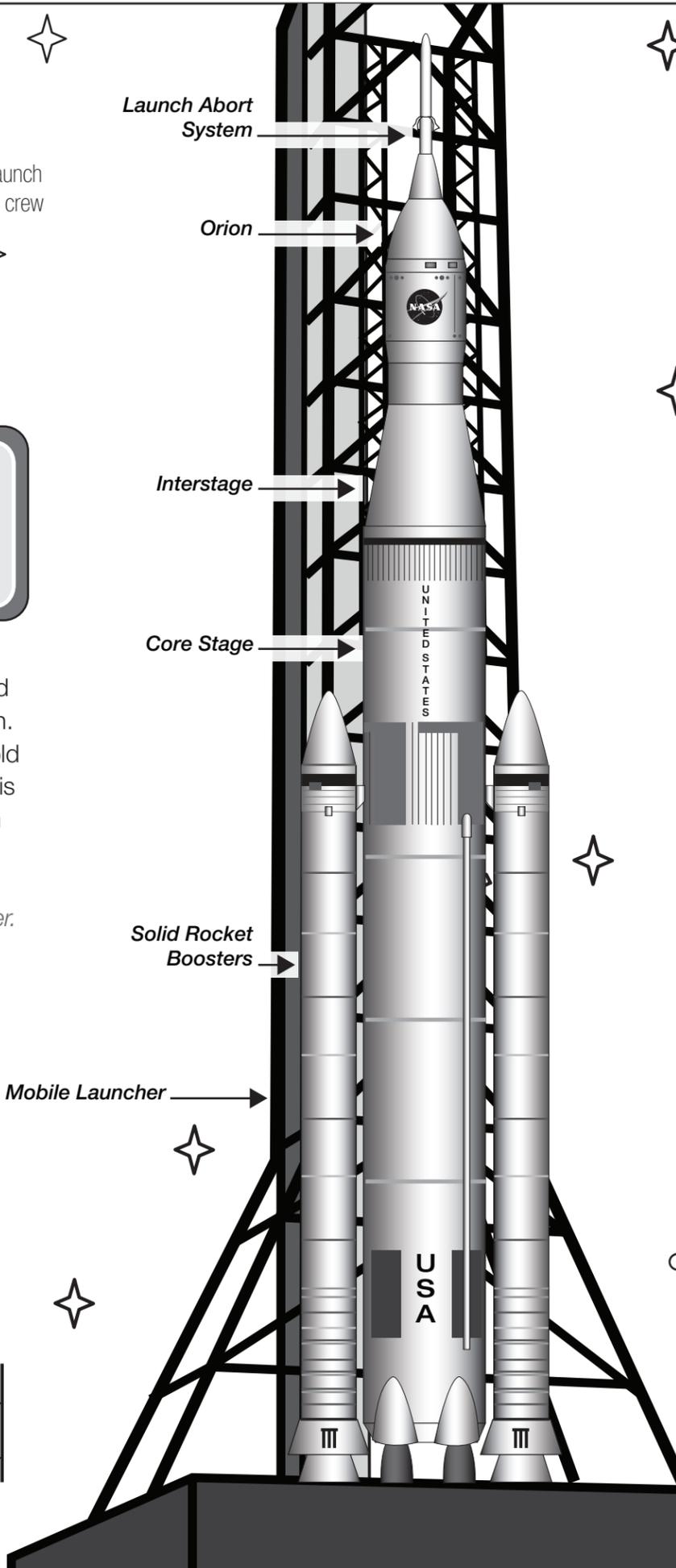
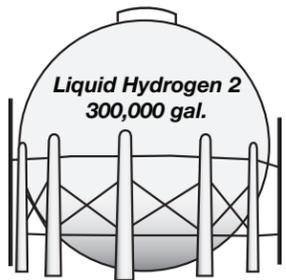
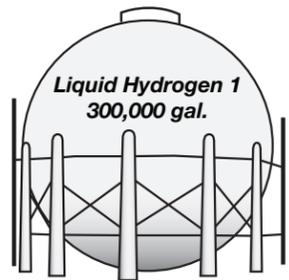
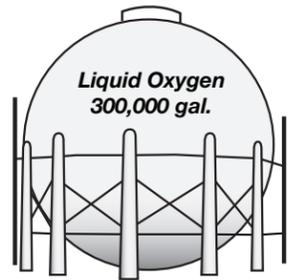
Fuel Up and Fly!

At Kennedy Space Center's launch site, Orion and the Space Launch System (SLS) are ready to blast off. Help the ground operations crew fill up for launch.

Fuel Fact: *Hydrogen can be found in large amounts in giant gas planets and stars.*

Fuel Fact: *Although oxygen gas is colorless, the liquid and solid forms of oxygen are blue.*

The SLS rocket holds 520,456 gallons of liquid hydrogen and 194,443 gallons of liquid oxygen. There are three tanks at the launch pad that hold 300,000 gallons of fuel each. Once the rocket is completely fueled, how much liquid hydrogen and oxygen will be left in each ground tank? Fill in the blanks. *Hint: You will need to totally empty one hydrogen tank before using the other.*



Learn about Orion and the Space Launch System (SLS)

Fill in the blanks to learn about the Orion Spacecraft.

Word Bank

Earth	constellations	69,000 pounds
Exploration Mission 1	Mars	low Earth orbit
four	20,000 mph	2017
321	154,000	

- This new spacecraft will take us farther than we've gone before, including _____.
- Orion is named after one of the largest _____ in the night sky.
- Orion is being rigorously tested as engineers prepare it for a journey beyond _____.
- The first SLS mission called _____, will occur in the year _____.
- The crew module can carry _____ astronauts.
- The SLS will stand _____ feet tall and will carry _____ pounds of payload.



Learn About Orion/SLS answer key

- Mars
- constellations
- low Earth Orbit
- Exploration Mission 1 and 2017
- four
- 321 and 154,000

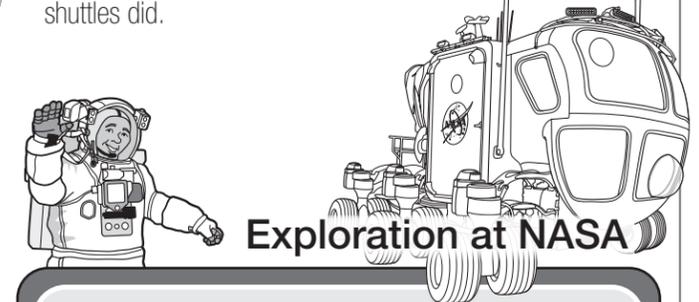
Fuel Up and Fly answer key:

Liquid Oxygen Tank: 105,557
 Liquid Hydrogen Tank 1: 0
 Liquid Hydrogen Tank 2: 79,544

***Answers**

Orion and SLS Fun Facts.

- Each part of the Orion spacecraft has been tested by NASA engineers and scientists. The Launch Abort System was tested in New Mexico, the parachutes at the U.S. Army Yuma Proving Ground. All of these will play a role in the planned uncrewed orbital flight test of Orion in 2014.
- Orion will utilize advances in propulsion, communications, life support, structural design, navigation and power, drawing from the extensive spaceflight experience of NASA and its industry partners.
- The first Orion test flight will occur in 2014. The spacecraft will launch 3,000 miles into space in order to reach speeds of more than 20,000 mph.
- Orion will have the capability to carry crew members to destinations such as near-Earth asteroids, our own moon, the moons of Mars and eventually Mars itself.
- The SLS height is 321 feet, which is taller than the Statue of Liberty.
- The SLS will use proven hardware and cutting-edge tooling and manufacturing technology from the Space Shuttle Program.
- The SLS will stand atop a modified mobile launcher and will launch from the same pad as the Saturn V and space shuttles did.



Exploration at NASA

This is the beginning of a new era in space exploration. We are building the capabilities to send humans beyond low Earth orbit and to destinations such as Mars. Orion and SLS are at the core of NASA's human exploration plans. Other technologies include new spacesuits, advanced communications systems, advanced propulsion methods and more! The road ahead is challenging but this approach to space exploration puts us in a position to go where no human has gone before. To learn more about NASA's exploration missions, please visit: www.nasa.gov/exploration/home.