

Mars Lab

How do we get to Mars?

This lab is intended as an “engineering” exercise. Walk the students through the issues below and then let them try to come up with solutions. The key here is that we want the kids using their **imagination**. While speaking “draw” as many visual ideas that you can. Please do NOT dismiss any ideas during the design phase. Once the design is done, then any discussion can take place on how feasible the idea’s are...

Background

Major considerations for traveling to Mars are the amount of time the trip takes, the amount of fuel needed for the trip, and the size of the payload (all the stuff they have to carry). A fast trip would be advantageous to the crew by reducing the time they are exposed to weightlessness, radiation, and other dangers inherent to space travel. However, fast trips require more fuel and that means less payload. People, equipment, and supplies would be reduced as larger amounts of fuel are carried to increase the speed of the trip. Earth and Mars move at different speeds around the Sun. The Earth completes its solar orbit every 365 days while Mars completes its orbit every 687 days. This happens for two reasons. First, the Earth is closer to the Sun so it travels less distance. Secondly, it travels faster in its orbit. Planets closer to the Sun travel faster.

Mars facts:

1. Mars is closest to Earth at 55,700,000 km (34,596,273 miles) away
2. 1 year on Mars = 687 days
3. 1 day on Mars is 24hrs 40 min
4. Diameter: Earth 12,756 km (7926 miles), Mars 6787 km (4220 miles)
5. Gravity 1/3 of Earth’s (.375)
6. Mars has 2 moons Phobos and Deimos
7. Atmosphere: Earth: nitrogen, oxygen, argon, others; Mars: mostly carbon dioxide, some water vapor (no oxygen)
8. Average Temperature: Mars: -81°F; Earth: 57°F

Why go to Mars? (from NASA, “Mars Science Goals”)

1. How does the composition of Mars differ from the Earth's and how have the two planets evolved differently?
2. How does the composition and state of the interior of Mars differ from the Earth's?
3. Is Mars still geologically active?
4. What resources are available at the surface for our future use?
5. Was there an early dense atmosphere on Mars?
6. Did Mars once have oceans?
7. What changes in climate has Mars experienced over its geologic history and what caused those changes?



8. How stable is the climate of Mars today?
9. If life once arose, is it to be found anywhere on Mars today?

Issues to think about:

- 1) It will take the Mars explorers about 6 months to get to Mars from Earth. The trip will be over 300 million miles (see path below). It will take 2 years before the explorers can return home.
- 2) Water: We will need 2 years worth of water (unless we find some on Mars)
- 3) Oxygen: We will need 2 years worth of Oxygen
- 4) No gravity and then low gravity. What happens to explorers in space for long periods of time?
- 5) Food: We will need 2 years worth of Food.
- 6) Explorers: How many and what type of people (professions) should we send? Astronaut, Biologist (study life), Geologist (rocks), Anthropologist (?), engineer (?), etc...
- 7) Temperature: The temperatures on Mars are very cold.
- 8) Energy: To power the spacecraft and equipment
- 9) Protection from radiation (i.e. solar rays)

Active Participation

- 1) Divide class into 6 teams.
- 2) Give each team paper, markers and crayons
- 3) Each team is responsible for designing (each team member should work on something different):
 - a. A spaceship
 - b. A crew
 - c. How much and what "Stuff" to bring
 - d. Where do they live while on Mars?
 - e. Do you think we will find life? If so, what might Martian life look like?
 - f. How do we get to Mars and then get back to Earth?
- 4) Give them about 10-15 minutes to design. Call "time" and then...
- 5) Have each team show and describe their design

If time permits, as a class, discuss the feasibility of each design. If there is no time, don't worry about it. The point of this lab is to use their imagination... "Imagination is more important than knowledge." Albert Einstein.

EARTH TO MARS

TEACHER ANSWER KEY

